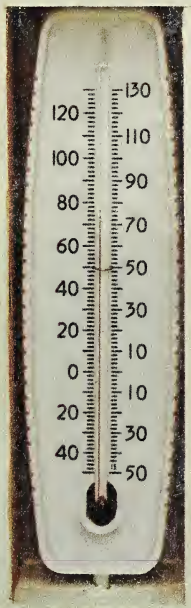
TEACHER'S EDITION

# Exploring Science

BLUE BOOK




# Exploring Science BLUE BOOK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# CONTENTS

# 1 Seed Plants



**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see page T12 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 15, 16, 19, 20, 23, and 27.


Do you think there are very large trees that grow from very small seeds? Why or why not?[1]

Do you think it is possible to know what kind of plant a seed will grow to be? If so, how?[2]

Where do you think seeds come from?[3]



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have the children read the questions below the cartoon and discuss their answers to the questions.

**Sample answers for questions below the cartoon:**

[1] I think that there are probably very big trees that grow from very small seeds because I have seen big plants grow from little seeds.

[2] I think it is possible to know what kind of plant a seed will grow to be if I know the kind of plant the seed came from.

[3] I think seeds come from plants.

# 1 Why are seed plants important?

Were you ever in a park? A field? A forest? If so, think about a time you were there in summer. You may have seen many kinds of plants. Those plants are just some of the many different kinds of plants growing in the world.

Though there are many different kinds of plants, some plants are alike in many ways. One way some plants are alike is that they grow from seeds.

Plants that grow from seeds are called *seed plants.* What are some plants that you think are seed plants?[1]

[1] **Sample answer:** Tomatoes, beans, peas.

**Main concepts of the chapter (pages 8–11):**
Plants that grow from seeds are called seed plants.
Seed plants are important to people in many ways.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—list some examples of seed plants;
—state three ways in which seed plants are important to people.

**Important words:** seed plants.

## Food

Seed plants are important to people in many ways. One of these ways is that seed plants are often used for food.

People eat parts of many seed plants. Apples and corn on the cob are parts of seed plants. What other foods do you know of that are parts of seed plants? [1]

People also use parts of seed plants to make food. Bread and peanut butter are such foods. Bread is made from parts of wheat plants. Peanut butter is made from parts of peanut plants.

What other foods do you know of that are made from seed plants? Which seed plants are they made from? [2]

### For You to Think About

There are many animals that eat only seed plants. Cows and sheep eat grasses and corn. What other animals do you know of that eat only seed plants? What do you think would happen if there were no seed plants for these animals to eat?

[1] **Sample answer:** Oranges, pears, cucumbers.

[2] **Sample answers:** Cornmeal is made from parts of corn plants. Strawberry jam is made from parts of strawberry plants.



**Suggested activity and discussion:** After discussing "Food," you may wish to have the children try the following activity related to seed plants as a source of food. First, have the children keep a list of all the foods they eat for one day. Then have them find out which of the foods they ate came from seed plants. You might then want to ask them these questions: How many of the foods you ate were made from seed plants? Do you think that seed plants are important to you? If so, why are they important? (Sample answers: Yes. Because many of the things I ate were made from seed plants.)

**Sample answers for "For You to Think About":** Some other animals that eat only seed plants are horses and deer. If there were no seed plants, these animals would most likely die.

## Exploring on Your Own

Paper is something people use that is made from seed plants. Find out from which seed plants paper is made. Also find out how paper is made. Use reference books to help you. Write a paragraph about what you find out.

## Things people use

Seed plants are important to people in another way. That is, many seed plants are used to make things people use.

Look around you. What things do you use that are made of wood? What are some other things made of wood?[1] What kind of seed plant do you think wood comes from?[2]

Many other things people use are made from seed plants. Some of these things are pictured below. Do you think they are important to people? Why or why not?[3]


[1] **Sample answer:** Chairs, tables, pencils, paper.

[2] **Sample answer:** From trees.

[3] **Sample answers:** Yes. Because people use many of these things almost every day.



**Sample findings for "Exploring on Your Own":** Trees are the seed plants used to make paper. Paper is made by first changing wood into pulp and by then pressing and drying the pulp into paper.

**Suggested research:** After discussing "Things people use," you may wish to point out that the peanut is a seed plant which is used to make many things besides peanut butter. Have the children discover other things made from the peanut by having them look in reference books under the heading *peanut*. (Sample finding: Peanuts are used to help make salad oils, margarine, soaps, face powders, shampoos, paints, fertilizer, and many other products.)

## Beauty

Still another way seed plants are important to people is for their beauty. Some parts of seed plants are green. Many people think this colour helps make places look beautiful.

Some seed plants grow flowers. Many people think that flowers look pretty and smell nice. How do you feel when you see and smell flowers?[1]

[1] **Sample answer:** I feel happy.

### *A Second Look*

1. What are seed plants?
2. What are some ways seed plants are important?
3. What are some things people use that are made from seed plants?

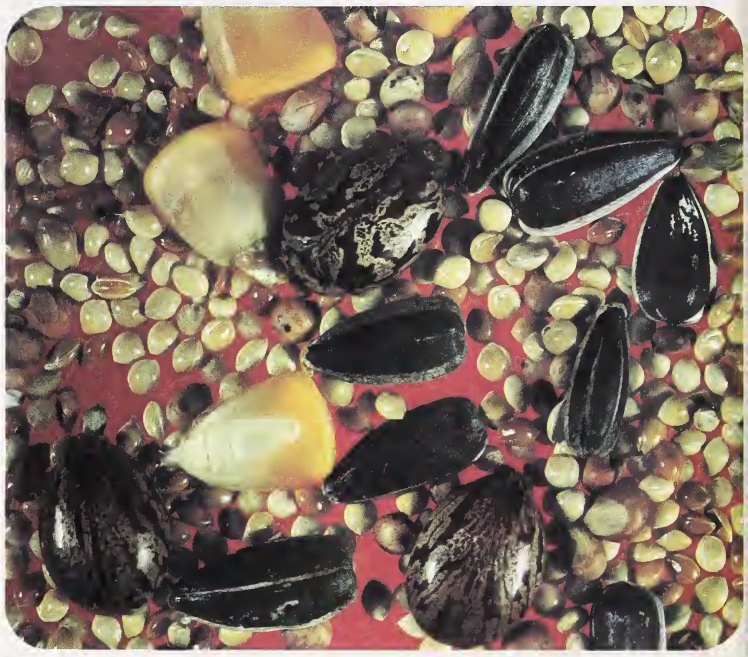


**Sample answers for "A Second Look":** 1. Seed plants are plants that grow from seeds. 2. Seed plants are important because they are used for food, for making things people use, and for their beauty. 3. Some things people use that are made from seed plants are wood, clothing, soaps, and medicines.

# 2 A closer look at seeds

As you may know, there are many kinds of seed plants. And each kind of seed plant makes its own kind of seed. What kinds of seeds have you seen?[1]

[1] **Sample answer:** Apple, cherry, tomato.



## How seeds travel

Suppose you could see many kinds of seeds at one time. You would see that each kind looks different. One way seeds look different is their shape.



**Main concepts of the chapter (pages 12–16):**
The shape of many seeds helps them travel.
A seed is made up of a seed coat, a tiny plant, and food for this plant.
Seeds need air, water, and warmth so they can grow.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—explain how the shape of seeds helps them travel;
—identify the three main parts of seeds;
—list the things seeds need so they can grow.
**Important words:** seed coat.

The shape of many seeds helps them travel. Why do you think seeds must travel?[1]

Look at the pictures below. In what ways are these seeds traveling?[2] Which seeds are helped to travel by their shape? How do you think their shape helps them travel?[3]



[1] **Sample answer:** In order to find a place to grow.
[2] **Sample answer:** The seeds in the top two pictures are traveling by sticking to clothing. The seed in the bottom left picture is being carried by a bird. The seeds in the bottom right picture are traveling by means of wind.
[3] **Sample answers:** All the seeds except the one being carried by the bird are helped to travel by their shape. The two kinds of seeds in the top pictures are shaped so they stick to people's clothing and to animals. The seeds in the bottom right picture are shaped so they are easily carried by wind.

## Parts of seeds

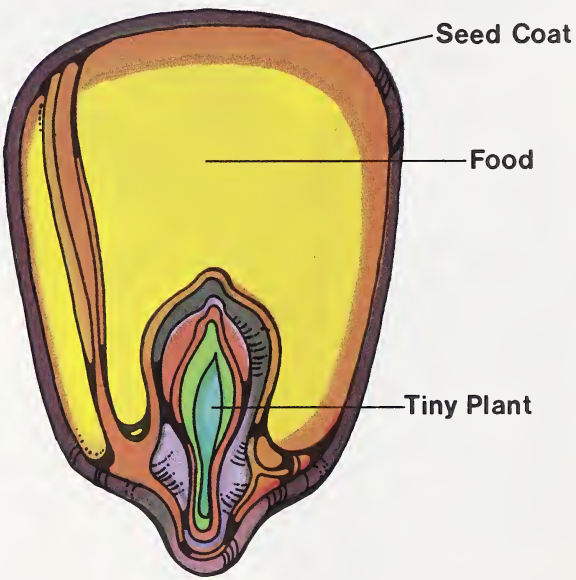
Though each kind of seed looks different, all seeds are alike in some ways. One of these ways is that seeds are made up of three parts. One part is called the *seed coat*. The seed coat is the outer cover of a seed. Why do you think seeds need to be covered?[1]

The other parts of a seed are found inside the seed coat. One part is a *tiny plant*. The other part is *food* for this plant. Why do you think this food is important?[2]

[1] **Sample answer:** So the inside of the seed is protected.

[2] **Sample answer:** So the tiny plant can grow.

**PARTS OF A CORN SEED**






**Suggested activity:** After discussing "What seeds need to grow" on page 15, you may wish to have the children see that seeds need warmth to grow. For them to do this, they will need two glass jars, about twelve seeds, and some paper towels. Have the children set up this activity the same as the one shown in the "Finding Out" on page 16, but have them put water in both jars. Then have the children put one jar in a refrigerator and the other jar in a warm place. After about a week, you may wish to ask the children these questions: In what way are the seeds in one jar different from those in the other jar? (Sample answer: The seeds in the jar kept in a warm place have grown, but those kept in the refrigerator have not.) Why do you think that warmth is important to seeds? (Sample answer: If they do not get enough warmth, they will not grow.)

## FINDING OUT

**What do the insides of some seeds look like?**

*You will need: 1 or 2 lima beans, 1 or 2 kidney beans, glass of water*

- Put the seeds (beans are seeds) in the glass of water. Let them soak overnight.
- The next day, take the seed coat off each seed.
- Break open the seeds.
- Draw some pictures showing what the inside of each seed looks like.

*What parts of the seeds did you find?*
*How are these seeds like the seed pictured on page 14? How are they different?*

### What seeds need to grow

Suppose you wanted some seeds to grow. These seeds would need some things so they could grow. What do you think these things are?[1]

You most likely know of many things you need so that you can grow. Two of these things are air and water. Seeds also need air and water so they can grow.

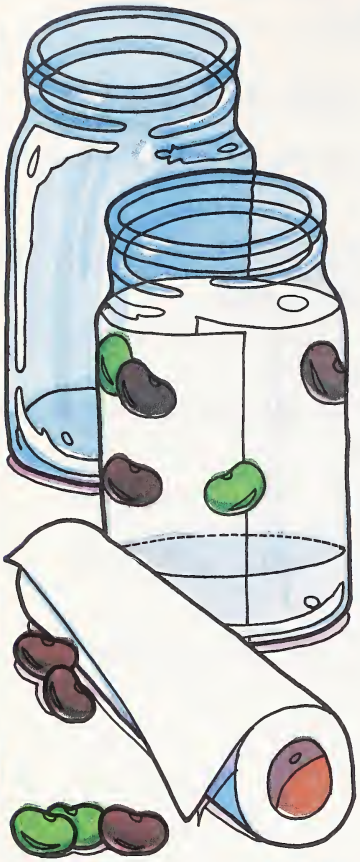
Along with air and water, seeds need warmth so they can grow. Do you think all seeds need the same amount of warmth? Why or why not?[2]

[1] **Sample answer:** Air, water, warmth.

[2] **Sample answers:** Probably not. Because some plants grow in places where it is cool most of the time and some grow in places where it is warm most of the time.



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, communicating.
*Sample findings:* After the children remove the seed coats and break open the seeds, they will most likely find the food and the tiny plant of each seed. The children may state that these seeds are like the corn seed pictured on page 14 in that they all have a seed coat, a tiny plant, and food for the plant. The children most likely will observe that these seeds are different from the corn seed in colour and in shape. Also, the food of the beans is split into two parts, while the food of the corn seed is not.



# FINDING OUT

**What happens to some seeds without water?**

*You will need: about 12 seeds, such as lima beans or kidney beans, 2 glass jars, paper towels*

- Put half of the seeds in a jar of water. Leave them there overnight.
- The next day, empty the jar and save the seeds.
- Put some paper towels, the seeds, and some water inside the jar as pictured.
- Set up the second jar as you did the first jar, but do not put water in the second jar.
- Leave the seeds in the jars for about a week.
- Look at the first jar every day to see that some water is in it.

*What happened to the seeds in the jar with water? Why?*
*What happened to the seeds in the other jar? Why?*

Save the jar of seeds with water in it. You will need the seeds later. Be sure they do not dry out.

## *A Second Look*

1. What are some ways seeds travel?
2. What are the three parts of a seed?
3. What do seeds need so they can grow?



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* After about a week, the children may observe that the seeds in the jar with water sprouted, but the seeds in the jar without water did not. From this, the children may infer that seeds need water to grow.

**Sample answers for "A Second Look":** 1. Seeds travel by sticking to people's clothing and to animals, by being picked up by animals, and by being blown about by wind. 2. The three parts of a seed are the seed coat, the tiny plant, and the food for the tiny plant. 3. Seeds need air, water, and warmth to grow.

# 3 What do seed plants need to grow?

What if you were to give a seed everything it needs to grow. You might find that it takes some time for the seed to begin to grow. But after a while, you would see a small plant growing from the seed. This small, young plant is called a *seedling*.

When you take care of a seedling, it should become a full-grown seed plant. How might you take care of a seedling? [1] How might you take care of a seed plant? [2]

[1] **Sample answer:** I would plant it in good soil, water it, and make sure it got enough sunlight.

[2] **Sample answer:** I would water it and make sure it got enough sunlight.

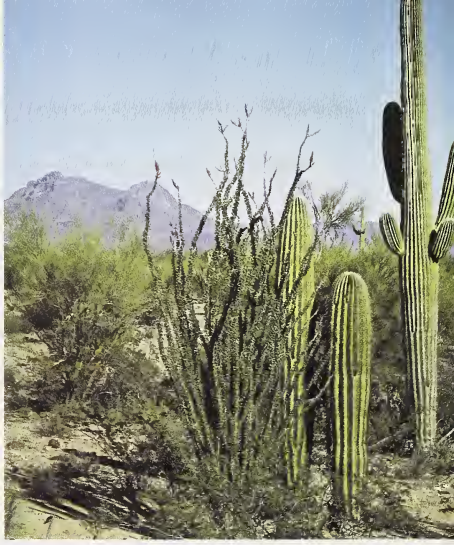
## Air, water, warmth

Like seeds, seed plants need air, water, and warmth so they can grow. But seed plants need other things as well. What do you think these things are? [3]

[3] **Sample answer:** Good soil, light.



**Main concept of the chapter (pages 17–20):** Seed plants need air, water, warmth, minerals, and light to grow.
**Performance objective:** After studying the information provided in this chapter, the children should be able to
—list five things seed plants need to grow.
**Important words:** seedling, minerals.



*Though the places in these pictures are different, seed plants can still grow in each place. Why do you think this is so?*

## Minerals

You may have seen many seed plants. If so, you may know that most of them grow in soil. Seed plants need things which come from soil so they can grow. Some of these things are called *minerals* [MIHN(-uh)-ruhlz]. Do you think some kinds of soil are better than others for seed plants? Why or why not?[1]

[1] **Sample answers:** Yes. Because some soils probably have more minerals in them than other soils do.

[2] **Sample answers:** No. Because some plants grow in the shade and others grow in the bright sunlight.

### For You to Think About

Suppose you had some seed plants growing in a garden. If some weeds started to grow in your garden, what would you do? Why?

## Light

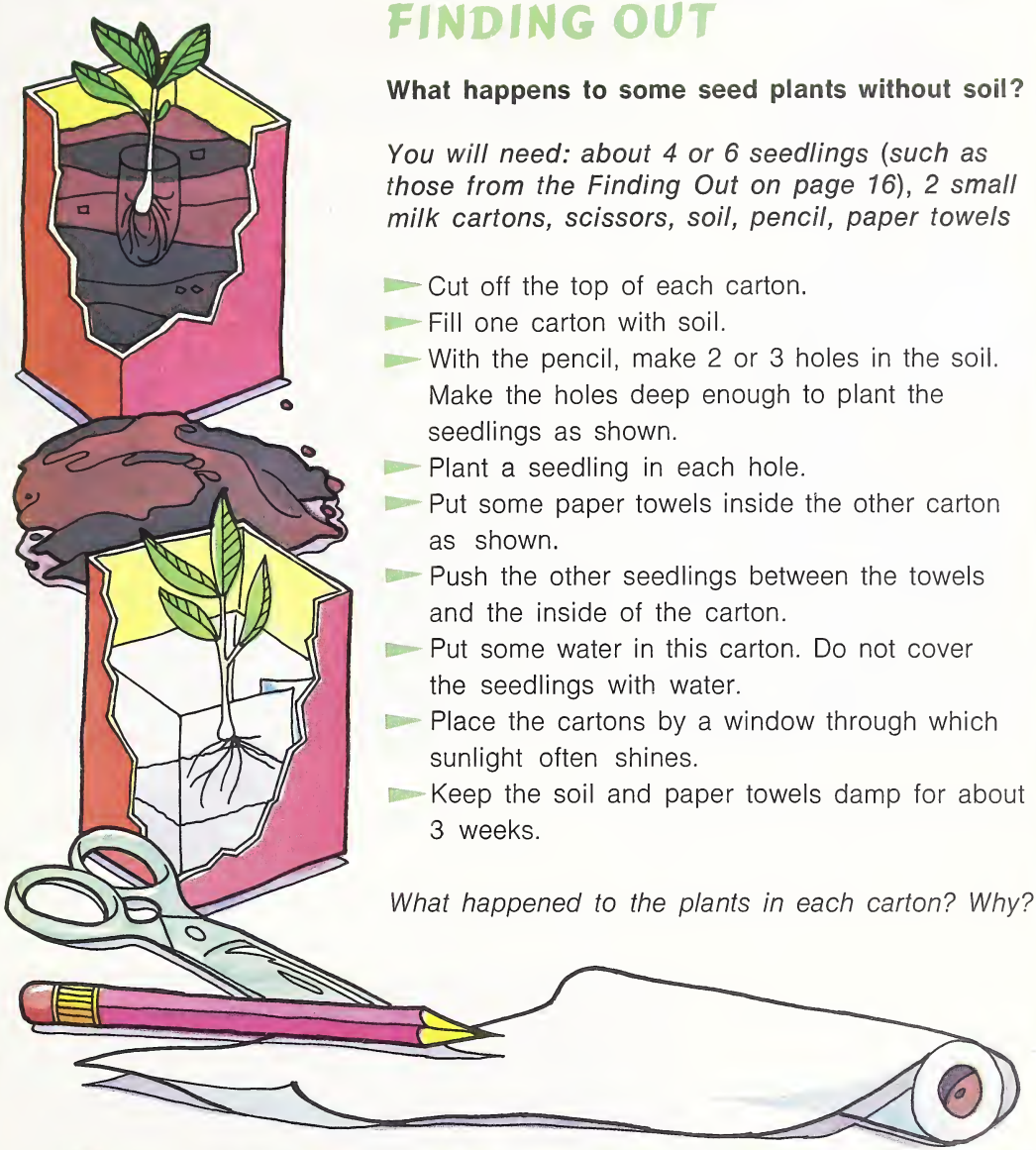
Another thing seed plants need so they can grow is *light*. Do you think all seed plants need the same amount of light? Why or why not?[2]



**Sample answer for "For You to Think About":** I would pull out the weeds so they would not use up the water and the minerals my plants need.

**Sample answer for the caption:** Because all seed plants do not need the same amount of warmth, water, minerals, and light.

**Suggested activity:** After doing the "Finding Out" on page 19, you might have the children find out if some soils are better than others for seed plants. Have the children cut off the top of two milk cartons. Then have them plant a seedling in one carton containing sand and plant another seedling in a carton containing lawn or garden soil. Have the children place both cartons in sunlight. Have them water the plants for a week or two. Then ask these questions: Which soil was better for the seedlings? Why? (Sample answers: The lawn or garden soil was better. Because the lawn or garden soil probably had more minerals in it.)



# FINDING OUT

**What happens to some seed plants without soil?**

*You will need: about 4 or 6 seedlings (such as those from the Finding Out on page 16), 2 small milk cartons, scissors, soil, pencil, paper towels*

- Cut off the top of each carton.
- Fill one carton with soil.
- With the pencil, make 2 or 3 holes in the soil. Make the holes deep enough to plant the seedlings as shown.
- Plant a seedling in each hole.
- Put some paper towels inside the other carton as shown.
- Push the other seedlings between the towels and the inside of the carton.
- Put some water in this carton. Do not cover the seedlings with water.
- Place the cartons by a window through which sunlight often shines.
- Keep the soil and paper towels damp for about 3 weeks.

*What happened to the plants in each carton? Why?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring. *Sample findings:* The children will most likely observe that the seedling in the soil will grow and that the seedling in the water will die. The children may infer from this that the one seedling died because it could not get the minerals it needed from the water.

# FINDING OUT

**What happens to some seed plants without light?**

*You will need: about 4 or 6 seedlings (such as those from the Finding Out on page 16), 2 small milk cartons, scissors, soil, pencil*

- Cut off the top of each carton.
- Fill the cartons with soil.
- With the pencil, make 2 or 3 holes in the soil in each carton.
- Plant a seedling in each hole as shown.
- Place one carton by a window through which the sun often shines.
- Place the other carton in a closet.
- Keep the soil in both cartons damp for about 2 weeks.

*What happened to the plants in each place after about 2 weeks? Why?*

## *A Second Look*

1. What is a seedling?
2. What things do seed plants need so they can grow?

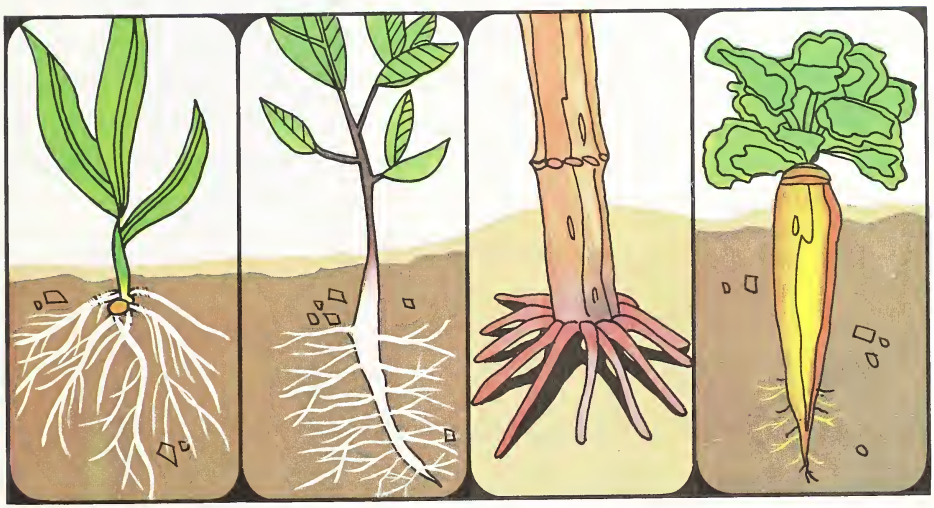


**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring. *Sample findings:* The children will most likely observe that the seedlings placed in sunlight will grow and that the seedlings placed in a closet will probably die. The children may infer from this that seedlings need light to live and to grow.
**Sample answers for "A Second Look":** 1. A seedling is a small, young seed plant. 2. Seed plants need air, water, warmth, minerals, and light so they can grow.

# 4 Other parts of seed plants

Have you ever tried to pull weeds out of the ground? If you have, you may know that this is not always easy to do! Weeds, like many other seed plants, are held tightly in the ground. What part of these plants do you think holds them in the ground?[1]

[1] **Sample answer:** The root.



*Different kinds of seed plants often have different kinds of roots. How are the roots in the pictures above different?*

## Root

As you may know, seed plants need water and minerals. These things may be found in the ground. One part of most seed plants grows in the ground. This part is the *root*.

Roots take in water and minerals from the ground. How do you think these things get from the roots to other parts of a seed plant?[2]

[2] **Sample answer:** By moving up the stem.



**Main concepts of the chapter (pages 21–27):**
Most seed plants are made up of four main parts—the root, the stem, the leaves, and the flower.
Each part of a seed plant does certain things which help the plant grow.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—identify the four main parts of most seed plants;
—explain what each part of a seed plant does to help the plant grow.
**Important words:** root, stem, leaf, carbon dioxide, flower.
**Sample answer for the caption:** One root is very big, and the others are small. All the roots grow deep into the ground except one.

## Stem

Another part of seed plants is the *stem*. The stem is the part just above the root. The trunk and branches of a tree make up the stem of a tree. Find the stem of the seed plants pictured below. How is the stem of each plant different?[1]

The stem of seed plants is important in many ways. One way is that it carries water and minerals from the root to other parts of the plant. Another way is that the stem holds up other parts of the plant. Why do you think it is important that the stem holds up these other parts?[2]

[1] **Sample answer:** One stem coils around things. One stem is small and stiff. One stem is large, stiff, and jointed. One stem is small and bends easily.

[2] **Sample answer:** So a plant can get the sunlight it needs. So water and minerals can travel from the roots to the other parts of a plant.

## FINDING OUT

**What parts of a stem carry water?**

*You will need: fresh celery stalk with leaves, a glass, red food colouring, scissors*

- Put some water in the glass.
- Put about 4 drops of red food colouring in the glass.
- Cut off the bottom of the celery stalk (celery stalks are stems) as shown.
- Place the celery in the glass.
- After about an hour, take the celery out of the glass.
- Break the celery at about the middle of the stem.
- Look at the inside of the celery where you broke it. Draw a picture of what you see.

*Did the leaves or parts of the leaves turn red? If so, how did the red water move through the stem to the leaves?*

### Leaf

Growing from the stem of seed plants is a part called the *leaf*. The leaf makes food for the plant. The plant uses some of this food to grow. The rest of the food is stored in the plant. When you



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring, communicating.
*Sample findings:* The children will most likely observe that the red food colouring has moved up through the small holes in the stem. The children may also observe that parts of the leaves turned red. From this, the children may infer that the red water moved through the small holes in the stem to reach the leaves.
*Additional information:* If the leaves or parts of them do not turn red after an hour, cut off a little more of the bottom of the celery stalk and try again.
*Extending the "Finding Out":* If you wish, you may have the children repeat this activity using white flowers and different colours of food colouring. You might then have the children use the different-coloured flowers to decorate their classroom.

eat carrots or beets, you are eating roots which are made up of this stored food. Why do you think a seed plant needs to make its own food?[1]

In order to make food, leaves must have water and minerals. Leaves get these things from the stem. They also must have something called *carbon dioxide* [KAHR-buhn dy-OK-syd] Carbon dioxide is a part of the air. Leaves put all these things together to make food. Leaves do this with the help of a *green colouring* found inside them and *light*.

Once food is made in the leaves, it mixes with water. Then the food is ready to be used or stored in other parts of the plant. How do you think the food gets to these parts?[2]

[1] **Sample answer:** Because a seed plant needs food to live and to grow.

[2] **Sample answer:** Through the stem.

*Though these kinds of leaves are different in size and shape, they are all able to make their own food. Why?*



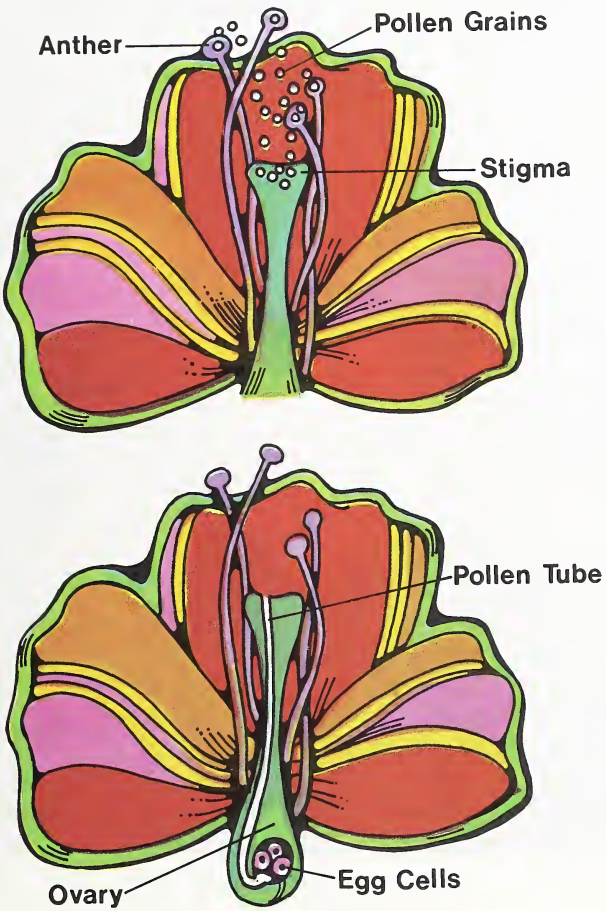
**Sample answer for the caption:** Because of the green colouring inside them.

**Suggested discussion:** After discussing "Leaf," you may wish to point out to the children that when they breathe, they take oxygen from the air and give off carbon dioxide. And when plants make their food, they use carbon dioxide from the air and give off oxygen. You might then want to ask the children these questions: Do you think that when plants make their food they help you in any way? If so, how? (Sample answers: Yes. Because these plants put oxygen into the air, which I need to breathe.)

## Flower

Many seed plants have still another part growing from the stem. This part is the *flower*. The flower is the part in which seeds are made. The pictures below show how most seeds are made.

Once seeds are made in the flower, some parts of the flower dry up and fall off. But one




*In order for seeds to be made in a flower, pollen grains from the anther must fall on the stigma. Pollen grains from the anther of another flower may land on the stigma of some flowers. How might this pollen get there?*

*Once a pollen grain lands on the stigma, the pollen grows a tube to the ovary. In the ovary, the pollen joins with an egg cell to become a seed. As the seed grows, the ovary becomes the fruit.*



**Suggested discussion:** After the children have read the information on this page, you might want to ask them this question: What do you think might happen if no pollen grains fell on the stigma? (Sample answer: There would be no seeds.)

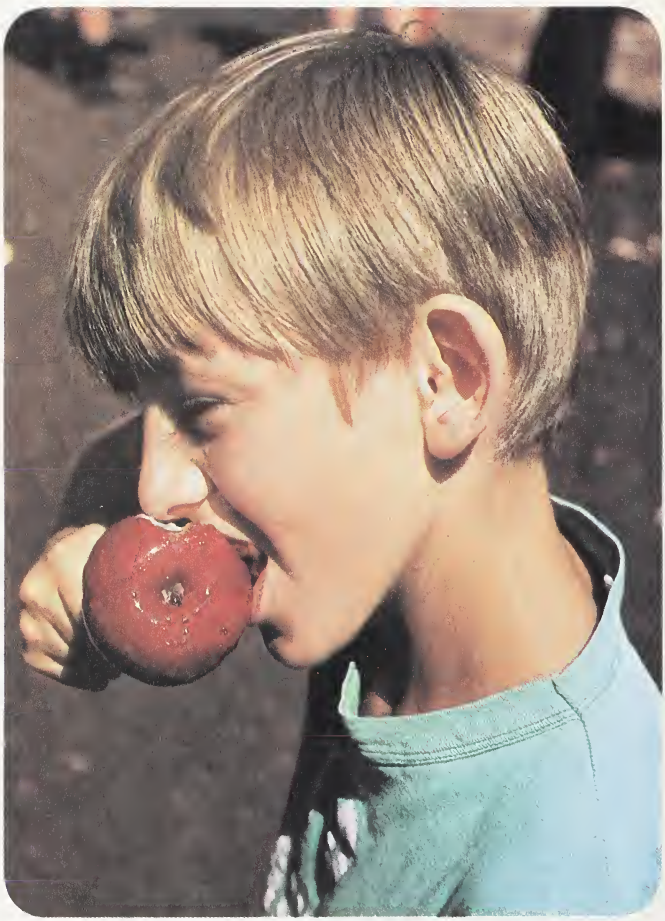
**Sample answer for the top caption:** Pollen grains may fall on the stigma when carried by wind and by insects, such as bees and butterflies.

### Exploring on Your Own

In some seed plants, seeds are not made in flowers. See if you can find out in which parts of these plants seeds are made. Look in reference books under the heading *cone-bearing trees*. Draw pictures to show what you find out.

part of the flower does not dry up and fall off. This part covers the seeds. It is the *fruit*. You may often eat some fruits such as apples. What other fruits do you know of?[1]

Why do you think it is important that the fruit covers the seeds?[2]



[1] **Sample answer:** Peaches, pears, plums, tomatoes, cucumbers.

[2] **Sample answer:** It protects the seeds from drying out and from being crushed.



**Sample finding for "Exploring on Your Own":** Some seed plants make their seeds in cones rather than in flowers.

## FINDING OUT

**Can seed plants grow from parts other than seeds?**

*You will need: white potato, carrot, 2 jars, knife*

- Cut the potato (white potatoes are stems) into pieces as shown. Make sure that each piece has a spot, or eye, on it.
- Cut the carrot (carrots are roots) into pieces as shown.
- Place the pieces of stem in one jar. Place the top piece of root in the other jar.
- Put some water in each jar.
- Look at the jars every day for about a week to see that there is some water in them.

*Did the pieces of stem and the piece of root grow? If so, what does this tell you about the ways some plants can grow?*

## *A Second Look*

1. What is the root, and why is it important?
2. Why is the stem important?
3. What part of a seed plant makes food, and what things are needed to make the food?
4. Why is the flower important?



**Teaching helps for "Finding Out":**
*Processes used:* observing, hypothesizing.
*Sample findings:* The children will most likely observe that the pieces of stem and the piece of root are growing. They may infer from this that some seed plants can grow from pieces of a stem and that some can grow from a piece of a root.
**Sample answers for "A Second Look":** 1. The root is the part of a seed plant that grows in the ground. The root is important because it takes in water and minerals from the ground. 2. The stem is important because it carries water and minerals from the root to other parts of the plant. Also the stem is important because it holds up the other parts of the plant. 3. The leaves of a seed plant make food for the plant. The things needed to make the food are water, minerals, carbon dioxide, a green colouring found inside the leaf, and light. 4. The flower is important because seeds are made in this part of the plant.

# Workers Who Use Science

In most parts of the world, people use seed plants for food. To have enough of this food, many people grow seed plants. People who do this for a living are called *farmers.*

Farmers do many things to help seed plants grow. To do these things, farmers use many ideas and practices learned from science. For instance, farmers break up soil before they plant seeds. Farmers know that breaking up soil helps seeds and roots get air and water. Farmers may also put *fertilizer* [FURT-uhl-EYE-zur] in soil. Farmers know that fertilizer gives seed plants minerals the plants may not get from soil.

To find out more about how farmers use science, try to find answers to these questions:

How do farmers keep weeds, insects, and diseases from hurting growing seed plants?[1]
What is plant breeding? Why is it important?[2]
What is crop rotation? Why is it important?[3]
What is irrigation? Why is it important?[4]

Along with sources of your own, writing to the following source may help you: Department of Agriculture, Information Division, Sir John Carling Building, Ottawa, Ontario K1A 0C7.

*Besides pumpkins, what other seed plants do farmers grow for food?*



**Sample answers for "Workers Who Use Science":**
[1] Farmers keep weeds, insects, and diseases from hurting seed plants by plowing the weeds into the ground and by spraying the plants with chemicals.
[2] Plant breeding is mating similar kinds of plants to make another similar kind of plant. Plant breeding is important because it often produces plants which are less likely to be hurt by certain diseases and more likely to produce more food per plant.
[3] Crop rotation is the practice of growing different crops from year to year in the same soil. Crop rotation is important because it helps keep the minerals in the soil from being used up.
[4] Irrigation is the practice of watering plants in areas where there is too little rainfall for plants to grow. Irrigation is important because it allows farmers to grow more plants than they normally could if they did not irrigate.
**Sample answer for the caption:** Corn, beans, peas.

## Reviewing the Main Ideas

Seed plants are important for beauty, food, and things people use.
The shape of many seeds helps them travel.
Seeds are made up of a seed coat, a tiny plant, and food for this plant.
Seeds need air, water, and warmth so they can grow.
Seed plants need air, water, warmth, minerals, and light so they can grow.
The root of a seed plant takes in water and minerals.
The stem of a seed plant carries water and minerals from the root to other parts of the plant. The stem also holds up other parts of the plant.
The leaf of a seed plant makes food for the plant.
The flower is the part of some seed plants in which seeds are made.
The seeds of some seed plants are covered by a fruit.

## Reading About Science


Branley, Franklyn M. *Roots are Food Finders.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1975.
Heady, Eleanor B. *Plants on the Go.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1975.
Petrie, Harris. *The Seed the Squirrel Dropped.* Scarborough, Ontario: Prentice-Hall of Canada Ltd., 1976.




**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 30.
**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of seed plants. Such articles might be found in reference books under the headings *plants, farming, gardening,* and *forestry.*

# Testing for Understanding

**Ideas to Check**

On your paper write *T* for each sentence below that is true. Write *F* for each sentence that is false.

T 1. When you take care of a seedling, it should become a full-grown seed plant.
T 2. Seeds need water, air, and light so they can grow.
T 3. The shape of many seeds helps them travel.
T 4. People use parts of seed plants to make food.
F 5. Seeds are made in the stem of a seed plant.

Write on your paper the word or words that best fit in each blank below. Choose from these words: *seedling, fruit, stem, carbon dioxide, root, leaf, seed coat, minerals.*

1. The ___ of a seed plant makes food for the plant.
2. Water and minerals are taken in from the ground by the ___ of a seed plant.
3. A ___ is a small, young seed plant.
4. ___ is the part of the air that seed plants need to make food.
5. The part of the flower that covers the seeds is the ___.

**Words to Use**

leaf
root
seedling
carbon dioxide
fruit



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Seed Plants" are provided for you on page T16 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional test questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**What Am I?**

1. I make a special food, but I am not a cook.
2. I am a coat, but people cannot wear me.
3. I am a seed plant, but I am not full grown.

**Fun with Words**

Try to make the letters below into words about seed plants.

tmes stem

orto root

alfe leaf

turif fruit

**Things to Do**

1. Find out what a greenhouse is. Ask your teacher to help you plan a visit to a greenhouse. Make a list of questions about seed plants you would like answered by someone who works in the greenhouse.

2. Grow your own vegetables. Leave some radish seeds and lettuce seeds in a glass of water overnight. The next day, plant the seeds in some large buckets of soil. If you take care of the seeds and seedlings, you should have radishes and lettuce in about six weeks. Try growing other vegetables.

3. Find two or three different kinds of flowers. Draw a picture of each flower. Then take the flowers apart and draw each part. How are the flowers alike? How are they different?



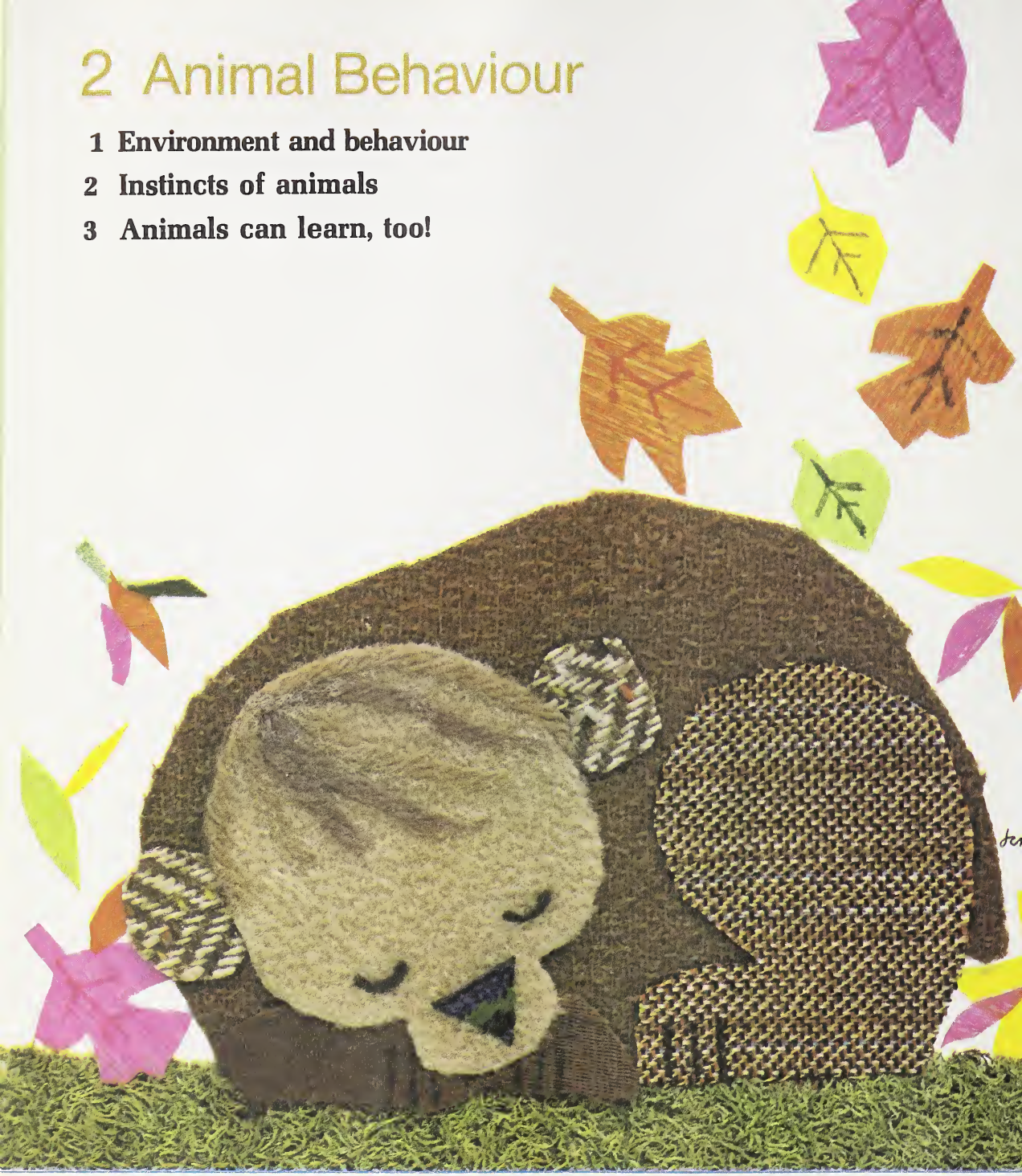
**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Seed Plants." You may also wish to encourage the children to make up additional activities related to the topic of seed plants.
**Answers for "What Am I?":** 1. A leaf of a seed plant 2. A seed coat. 3. A seedling.

# 2 Animal Behaviour

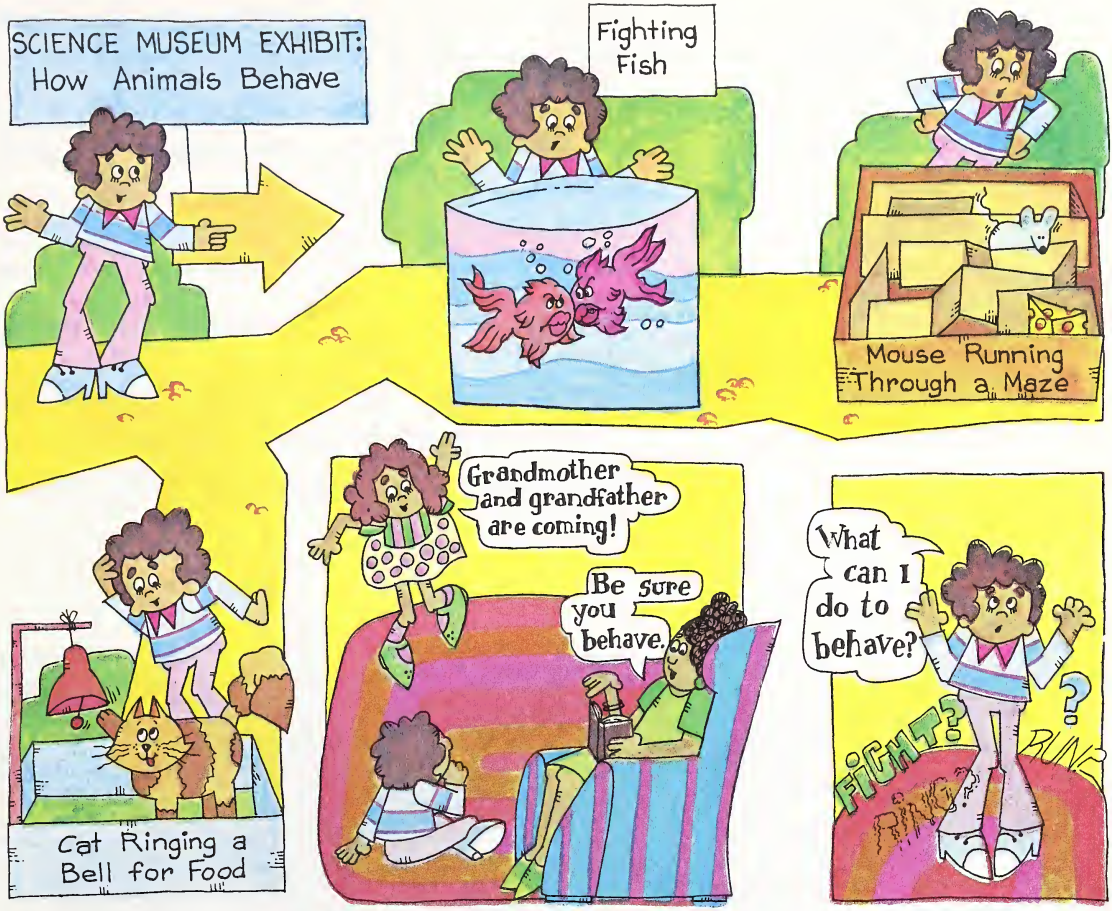
1 **Environment and behaviour**

2 **Instincts of animals**

3 **Animals can learn, too!**



**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see pages T12–T13 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 37, 39, 42, 46, 51, 56, and 58.




What are some other ways animals behave?[1]

What are some things that might make animals behave as they do?[2]

Where have you had fun watching animals?[3]



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have the children read the questions below the cartoon and discuss their answers to the questions.

**Sample answers for questions below the cartoon:**

[1] Dogs burying bones, squirrels burying nuts, and cats climbing trees are some other ways animals behave.

[2] Heat, light, and water are some things that might make animals behave as they do.

[3] I have had fun watching animals at a park and at a zoo.

# 1 Environment and behaviour

Have you ever watched fish? Or a cat? Or a dog? If so, you know animals are often fun to watch. It's fun to watch a dog wag its tail when it is happy. How do you think a cat acts when it is happy?[1]

Each kind of animal has its own way of acting. The way an animal acts is called its *behaviour* [beh-HAY-vyur].

Look at the pictures of the animals shown below. How are they behaving? What things in their *environment* [ihn-VY-ruhn-muhnt], or surroundings, might be making them behave as they are?[2]

[1] **Sample answer:** It purrs.

[2] **Sample answers:** Both kinds of animals are curled up. The earthworms because of too much water in the soil. The hedgehog as a protection against an intruder.



**Main concepts of the chapter (pages 34–43):**
The way an animal acts is called its behaviour. Certain things in an animal's environment, such as light, heat, and water, may make the animal behave as it does.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—list some examples of animal behaviour;
—state three things in the environment that may make an animal behave as it does.

**Important words:** behaviour, environment.

## Heat and behaviour

Many things around an animal may make it behave the way it does. One of these things is heat. Things which are warm may make an animal behave one way. Things which are cold may make it behave another way.

***Heat "bugs" insects.*** Maybe you have listened to a cricket chirp. If so, you may know that when the air is warm, a cricket chirps fast. When the air is cool, it chirps more slowly. How do you think heat might make other insects behave?[1]

[1] **Sample answer:** It makes most insects move about more.

*The skin of this salamander must be kept moist and cool. How might crawling into this hole help the salamander do this?*



**Suggested activity:** After discussing "Heat and behaviour," you may wish to have the children observe how heat and cold affect beetles. For them to do this, the children will need about six beetles, crushed ice, warm water, and four cups. Have the children number the cups 1 through 4. Have them put the ice in cup 1, one half the beetles in cup 2, the other half in cup 3, and warm water in cup 4. Then have the children place cup 2 into cup 1 and cup 3 into cup 4. Have them wait about five minutes and then observe the behaviour of the beetles in both cups. Then ask the children these questions: Do you think that heat and cold affect the behaviour of beetles? If so, how? (Sample answers: Yes. Because the beetles in cup 2 stopped moving, while the beetles in cup 3 kept moving about.)

**Sample answer for the caption:** Because there is moisture in the soil and because there is less heat in places where the sun cannot shine.

***Something's fishy.*** Have you ever gone fishing in a lake during summer? If so, you may have caught a fish close to the top of the lake. But what if you were to try to catch the same kind of fish in winter. You might have to fish deeper. Why do you think this might be so?[1]

In summer, the water is warmer at the top of a lake. In winter, the water is warmer down deep. Some fish go to warmer water. Other fish go to cooler water. Why might this be so?[2]

[1] **Sample answer:** Because this kind of fish has probably gone toward the bottom of the lake, where the water is warmer.

[2] **Sample answer:** Fish go to warmer or cooler water, depending on what the fish are used to living in.



**Suggested activity and discussion:** After discussing "Heat and behaviour," you may wish to have the children observe and list the ways in which heat and cold make some animals in their neighbourhood or home behave. Have the children compare and discuss their lists with others in their class.

## FINDING OUT

**How does cooling or warming a goldfish's water change its breathing?**

*You will need: 1 goldfish in a large glass jar half filled with water (at room temperature), clock with a second hand, thermometer, cold water, warm water*

- Write down the temperature of the goldfish's water.
- Write down the number of times the fish breathes in 1 minute. You can find this out by counting how many times its gills open and close.
- Add a little cold water to the jar *slowly*. Do not let the temperature go down more than 3°C in 15 minutes, or you may hurt the fish.
- Write down the temperature of the water in the jar.
- Write down the number of times the fish breathes in a minute.

*How does cooling the water change the breathing of the goldfish?*
*What do you think would happen to the breathing of the goldfish if you made the water warmer than room temperature? Try finding out.*

***Ouch! That's hot!*** Heat sometimes makes you behave in a certain way. What if you put your hand on a hot pan. You would pull your hand away at once. At what other times might



**Teaching helps for "Finding Out":**
*Processes used:* observing, collecting data, communicating, predicting.
*Sample findings:* The children may observe that cooling the water slows down the goldfish's breathing. The children may predict that warming the water will speed up the goldfish's breathing.
*Additional information:* If the children wish to observe how warming the water affects the breathing of a goldfish, have them follow the steps as given in the "Finding Out" above, but use warm water in place of cold. Be sure the water temperature is not raised more than 3°C in fifteen minutes, or it may harm the fish.

something hot make you behave in a certain way?[1]

What would happen if you were taking a shower and the water suddenly turned cold? You might start to shiver. How else might something that is cold make you behave?[2]

[1] **Sample answer:** When it is too hot in a room, I may open a window.

[2] **Sample answer:** When I get too cold, I may put on a sweater.

## Light and behaviour

Another thing which may make an animal behave as it does is light. When have you seen light make an animal behave in a certain way?[3]

***Hide and seek.*** As you may know, some animals move around in daytime. Others move around at night. One animal that moves around at night is the cockroach. Cockroaches feel their way in

### Exploring on Your Own

You may have seen moths flying in circles around a light on a summer night. Find out why moths do this. Also find out if other insects do this. You may wish to use reference books. Look under the headings *moths* and *insects*.

[3] **Sample answer:** I have seen an earthworm go into the ground when someone shines a light on the earthworm.

*What do you think helps this cockroach feel its way in the dark?*



**Sample finding for "Exploring on Your Own":** A moth uses light from the moon and the sun to keep its sense of direction. When a moth sees light from a streetlight, the moth's sense of direction is confused, causing it to fly about the streetlight in a circle.

**Sample answer for the caption:** Its long feelers.

**Suggested discussion:** When discussing "Light and behaviour," you may wish to point out to the children that some animals behave in certain ways at sunrise. You might then ask them the following questions: What animals do you know of that behave in certain ways at sunrise? In what ways do they behave? (Sample answers: Roosters crow. Other birds begin to sing.)

the dark when looking for food. They do not like light. So when someone turns on a light, they run for cover.

What other animals do you know of that do not like light?[1]

[1] **Sample answer:** Earthworms, owls, bats.

## FINDING OUT

**What does light make earthworms do?**

*You will need: about 6 earthworms, pie pan, aluminum foil*


- Stretch the foil over half of the pie pan. There should be room for the worms to crawl under the foil.
- Place the worms in the uncovered part of the pie pan.

*Where do the worms go? Why?*

- Write down the number of worms that move toward light. Write the number of worms that do not.

*If you tried this 3 or 4 times, do you think the worms would do the same thing? Try finding out.*



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring, collecting data, predicting.
*Sample findings:* The children will probably observe that the worms crawl under the covered portion of the pie pan. The children may infer from this that the worms do not like light. The children may then predict that the worms will do the same thing every time.

***Watching eyes.*** Look at the eyes of someone near you. See how big the pupils of the eyes are. The pupil is the black, round spot in the centre of the eye.

Have that person close both eyes for a minute. When the person's eyes are opened, look quickly at the pupils of the eyes. What happened to the pupils while the eyes were closed?[1] What happened to the pupils when the eyes were opened again? Why?[2]

[1] **Sample answer:** They got bigger.

[2] **Sample answers:** They got smaller. Probably because of the light.

*Owls come out at night. How do you think the large pupils in their eyes help them?*

## Water and behaviour

Still another thing which may make an animal behave as it does is water. How do you think water might make some animals behave?[3]

[3] **Sample answer:** Too much water might make earthworms and ants come out of the ground.



**Sample answer for the caption:** They let more light in so the owls can see well at night.

***At home on the rocks.*** Look at the pictures of the animal on this page. It is a *chiton* [KYT-uhn]. It lives on the rocks at the seaside. When the water is high, it covers the animal. The chiton, like a fish, needs to be covered with water so that it can breathe.

When the water is low, it does not cover the animal. The animal becomes dry. What do you think the animal will do so it can keep breathing? [1]

[1] **Sample answer:** The chiton will move to where it can be covered with water.



**Suggested research:** After discussing "Water and behaviour," you may wish to have the children find out about another animal that behaves in a certain way because of water. You might have the children look in reference books under the heading *lungfish.* (Sample finding: When a river or lake dries up, a lungfish buries itself in the mud and is able to stay alive until water returns and frees the lungfish from the dried mud.)

## FINDING OUT

**How does being wet or dry make an earthworm behave?**

*You will need: about 6 earthworms, pie pan, 2 paper towels, tape*

- Place the towels in a pie pan. Do not let the towels touch each other. Hold them down with tape.
- Wet one of the towels.
- Place half of the worms on the wet towel.
- Place the other half on the dry towel.

*What do you think will happen?*

- Watch the worms.

*Which way does each worm move? Why?*

- Try it again.

*Do the worms move the same way? Why?*

*A mud bath!* If you have ever seen a turtle, you know turtles live in water. At times they come out of the water to sun themselves. When they become dry, they go back into the water.

Sometimes a pond may dry up. Turtles in the pond then bury themselves in the mud where



**Teaching helps for "Finding Out":**
*Processes used:* predicting, observing, inferring, comparing.
*Sample findings:* The children may predict that the earthworms will move from the dry towel to the wet towel. After observing the earthworms, the children will most likely say that all the worms did move to the wet towel to keep their body moist. The children may also predict that the earthworms will always move from the dry towel to the wet towel.

it is wet. They stay covered until it rains. The rain helps them get moving again.

Heat, light, and water are only a few things which make animals behave as they do. What other things around animals make them behave as they do?[1] How do these things make animals behave?[2]

## A Second Look

1. What is meant by animal behaviour?
2. What are some things around an animal that may make it behave as it does?

## For You to Think About

Earthworms often come out on the sidewalk after a heavy rain. Why do you think they leave their home when the ground is wet?

[1] **Sample answer:** Other animals and people.

[2] **Sample answer:** They may make some animals hide and others fight.



**Sample answers for "A Second Look":** 1. Animal behaviour is the way in which an animal acts. 2. Some things around an animal that may make it behave as it does are heat, light, and water.

**Sample answer for "For You to Think About":** Because the rain fills many of the tunnels, causing the earthworms to come out to breathe.

## 2 Instincts of animals

As you may know, things around an animal may make it behave as it does. Light makes cockroaches run away and hide. Other animals may be drawn to light. Such behaviour is very simple.

But what about when a mother bird sits on her eggs to keep them warm? That behaviour is not so simple. Yet she does not have to learn to do this. She does this because of an *instinct* [IHN-stihng (k) t]. An instinct is the ability to do something without having to learn how. Animals are born with instincts.



**Main concepts of the chapter (pages 44–52):**
Animals are born with instincts, or abilities to do some things without having to learn how.
Animals may have an instinct for building things, guarding their place, traveling, or living together.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—define by example what an instinct is;
—list four different animal instincts.
**Important word:** instinct.

## Building things

Instincts may help an animal do many things. An instinct may help an animal build something.

*Spider school?* You may have seen a spider make a web. Spider webs look hard to make. Yet no one has to teach a spider how to make a web. The first web a spider makes is just right. An instinct helps it make the web. How do you think a web is helpful to a spider?[1]

### For You to Think About

Some animals, like many birds, make very strong homes. Other animals, like elephants, make no homes at all. Why do you think some animals do not make homes?

[1] **Sample answer:** It helps a spider catch the food it needs.



**Sample answer for "For You to Think About":** Because they are not born with the instinct to make homes.

*Nest making.* What if you found a bird's nest. Could you tell what kind of bird made it? All robins make the same kind of nest. Other birds make their own kind of nest. An instinct helps them do this.

Do you think it is important that instincts help animals build things? Why or why not? [1]

[1] **Sample answers:** Yes. If animals such as birds and spiders did not have instincts to build things, the animals would most likely not survive.

## FINDING OUT

**Can you build a bird's nest as well as a bird?**

*You will need: mud, twigs, leaves, yarn, newspaper, cup of water*

- Open the newspaper on a desk or table.
- Using the rest of the materials, try to make a bird's nest like the one in the picture.
- Let it dry overnight.

*What did you find hard to do in making the nest? If you were to make more nests, do you think you would become better at making them? Why or why not?*
*Do you think a bird finds it hard to build its first nest? Why or why not?*

- Compare your nest with the ones made by other people in your class.

*Do they look the same? Why or why not?*



**Teaching helps for "Finding Out":**
*Processes used:* experimenting, communicating, predicting, inferring, hypothesizing, comparing.
*Sample findings:* The children will most likely observe that it is hard to keep their nest from falling apart. The children may predict that if they were to practice making nests, the nests would not improve much because the children do not have the instinct for nest building. The children may also predict that a bird does not find it hard to build its first nest because a bird has the instinct for nest building. After the children compare the nest they made with those made by others in the class, the children may state that few, if any, of the nests look alike. The children may conclude that this is so because none of them have the instinct for nest building.

## Guarding their place

Besides helping animals build things, instincts help them do other things. An instinct may help animals guard the place that belongs to them.

***Singing guard.*** Think of the last time you heard a bird sing. You may have thought it was singing because it was happy. But many birds sing to say, "This is *my* place. Stay away, stay away!"

***Barking police dog.*** If you or a friend have a dog, you may have seen how it guards its home. It may bark if someone comes to its home. It may even bark if someone goes by outside. This seems to be its way of saying, "This place belongs to me."

Do you think it is important that animals guard their place? Why or why not?[1]

### Exploring on Your Own

The ways instincts work have puzzled people for a long time. But people do know some things about instincts. Find out how some instincts are thought to work. Look in a reference book under the heading *instinct*.

[1] **Sample answers:** Yes. Otherwise an animal may not be able to keep the food it needs nor have a place to raise its young.

*Animals sometimes fight for reasons other than guarding the place that belongs to them. Why might these rhinos be fighting?*



**Suggested research and activity:** After discussing "Guarding their place," you may wish to have the children find out about other ways some animals guard their place. For them to do this, you might have the children look in reference books under the headings *animal, rattlesnake, skunk,* and *bee*. After the children have found out about some of these other ways, you might have each child choose one animal, draw a picture of it, and explain to the other children how this animal guards its place. (Sample finding: A rattlesnake shakes its tail and injects a venom through its fangs.)

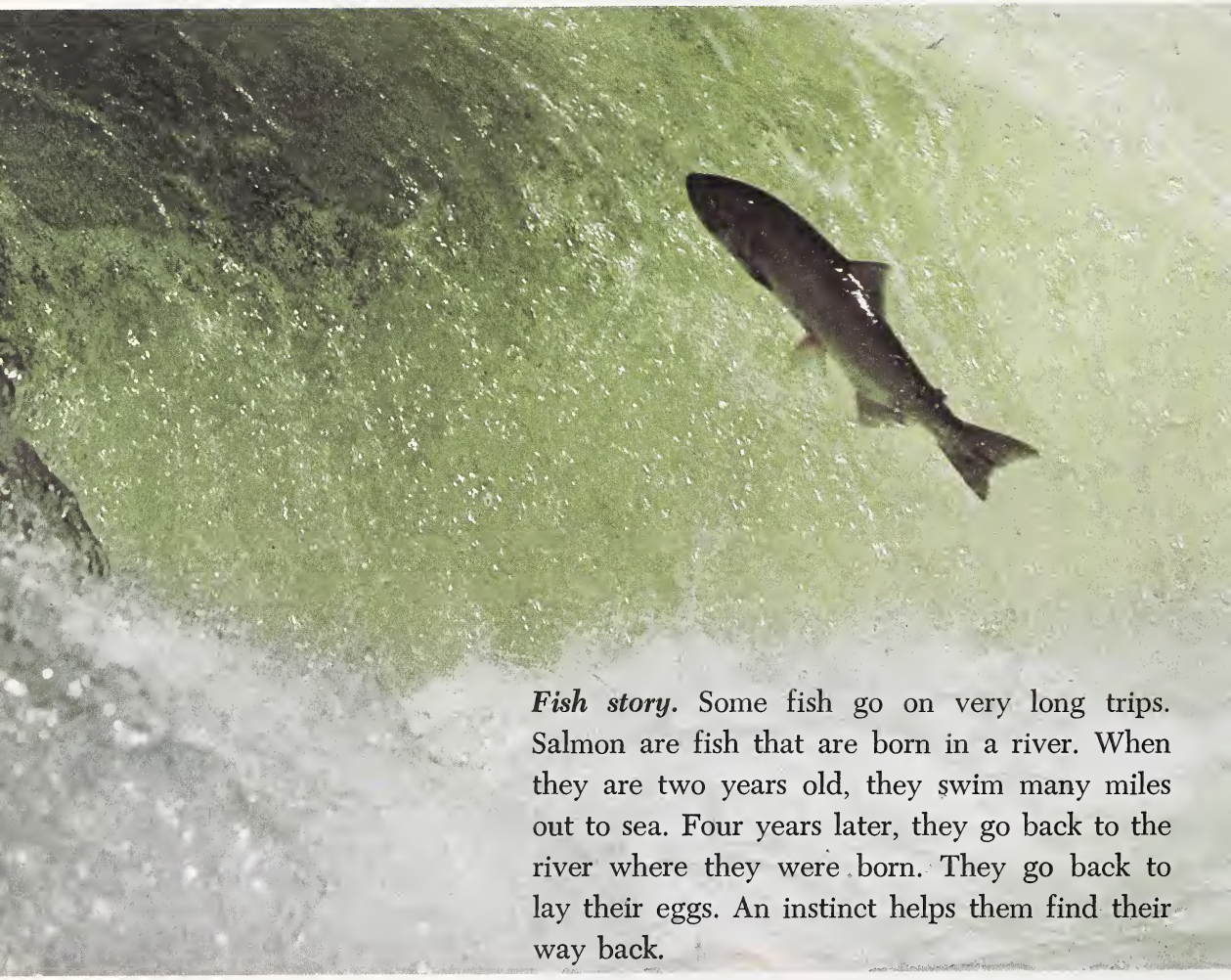
**Sample findings for "Exploring on Your Own":** Some instinctive behaviour is thought to come about because of changes within an animal's environment. Other instinctive behaviour is thought to come about because of changes within an animal's body.

**Sample answer for the caption:** They might be fighting over a mate.

## Making trips

Another thing many animals do is travel. Yet they do not plan their trips. How do you think they know when and where to go?[1]

[1] Sample answer: They probably have an instinct that helps them.



***Fish story.*** Some fish go on very long trips. Salmon are fish that are born in a river. When they are two years old, they swim many miles out to sea. Four years later, they go back to the river where they were born. They go back to lay their eggs. An instinct helps them find their way back.



**Suggested discussion:** At this time, you may wish to point out to the children that the salmon shown above is trying to return to the part of the river where it was born. Then, you might want to ask the children these questions: Do you think that a salmon has a strong instinct for returning to where it was born? If so, why do you think so? (Sample answers: Yes. Because it is swimming against the flow of water and it is trying to jump a waterfall.)

***Birds buzz off.*** In many places, there are more birds in the summertime than in the wintertime. Where do you think some of the birds go for the winter?[1]

People who study birds put tags on some of them. These tags have an address. If anyone finds a bird with a tag, that person is asked to return the tag to the address. The person is also asked to tell when and where the bird was found. This way it is known where these birds go for the winter. Why do you think it is better for some birds to fly away for the winter?[2]

[1] **Sample answer:** They probably fly south where it is warmer.

**For You to Think About**

Some animals, like salmon, make very long trips. Other animals, like squirrels, do not travel much at all. Why do you think some animals do not travel much?

[2] **Sample answer:** Because there is less food for birds to find in places which have cold winters.



**Suggested activity:** After discussing "Birds buzz off," you may wish to have the children become familiar with the kinds of birds that live in their neighbourhood. For them to do this, you might have the children build a bird feeder and observe the birds that come to feed during the year. You might also have the children draw pictures of the birds they see and try to identify them by using reference books.

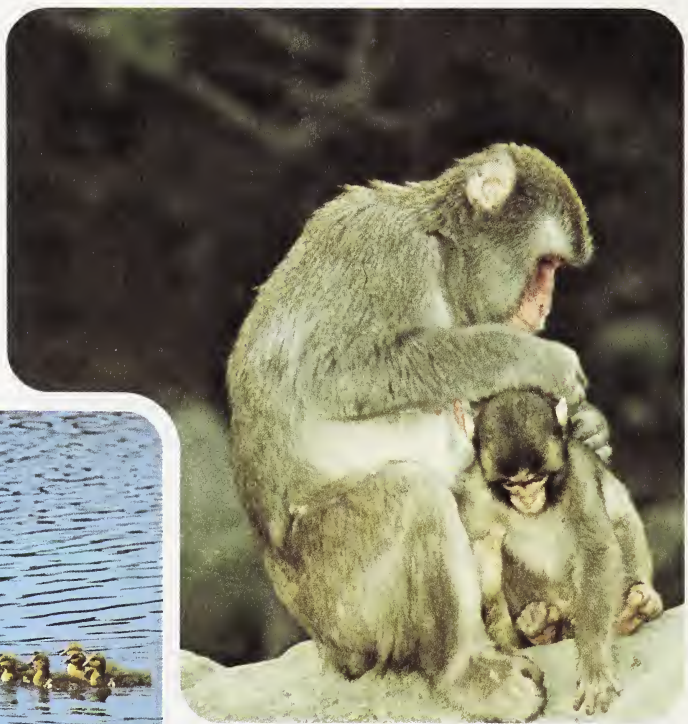
**Sample answer for "For You to Think About":** Because they can find the food and shelter they need where they are.

## Living together

Sometimes animals live together in a family. This helps the animals in many ways.

***Fish families.*** Some fish protect their baby fish. Bigger fish might eat them. The father fish cares for the babies for a while. The mother fish takes over when he is tired. What do you think makes these fish take care of their baby fish?[1]

[1] **Sample answer:** An instinct.



*Not all animals live in a family as these monkeys and ducks do. What animals do you know of that do not live in a family?*

**Sample answer for the caption:** Turtles, frogs, worms, flies, crickets, grasshoppers.

**Suggested discussion:** When discussing "Living together," you may wish to have the children discuss ways in which living together in a family helps them. You might start the discussion by asking the children the following question: In what ways does living together in a family help you? (Sample answer: It helps me by providing me with food, clothing, a home, and love.)

## FINDING OUT

**How can you watch the behaviour of some small animals?**

*You will need: small animals (such as worms, beetles, and spiders), widemouthed jar with a lid, food wrap, piece of wood, pebbles, sand, small jar lid, stones, small plants, soil*

- Cut the piece of wood as shown. Lay the jar on its side with the neck resting on the wood.
- Place a layer of small pebbles in the jar.
- Add a layer of sand. Put the small jar lid in the sand as a pond. Put some water in it.
- Add some soil, stones, small plants, and a twig or two.
- Put holes in the lid of the jar.
- Cover about half the mouth of the jar with food wrap. Put the lid on the jar.
- Put the jar in a cool place (about 18°C).
- Let it stand for 2 or 3 days. If the sides are very wet, you need fewer plants or more air.
- Add the animals you want to watch. Also add any food they might need.

*Which animals like to get under things?*
*Which animals like to move about?*
*What other kinds of animal behaviour do you see?*
*Why do you have to know something about an animal's behaviour when keeping it in a jar?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, classifying, interpreting data.
*Sample findings:* The children will most likely observe that animals such as worms like to get under things and that animals such as beetles and spiders like to move about. The children may also observe that the worms begin tunneling into the soil and that the spiders begin spinning webs. The children may infer that knowing something about an animal's behaviour when keeping it in a jar can be helpful in providing the things the animal needs to survive.
*Extending the "Finding Out":* At this point, you may wish to have the children learn about the behaviour of some other animals. Have the children observe the behaviour of birds, squirrels, their pet, or any other animal they can observe daily for about a week. You might then have the children describe the animal behaviour they saw.

***Bird feeders.*** Have you ever watched baby birds eat? If so, you know baby birds need very much food. In fact, both the father and mother must work together to get enough food for the babies. Later, some birds teach their little ones to find their own food. They do all these things by instinct.

How else might instincts help animals living in a family?[1]

[1] **Sample answer:** Instincts might help some animals teach their young to protect themselves.

## *A Second Look*

1. What is meant by an instinct?
2. Why are instincts important to animals?
3. What are some instincts that animals have?



**Sample answers for "A Second Look":** 1. An instinct is the ability to do something without having to learn how. 2. Instincts are important to animals because instincts help animals survive. 3. Some instincts animals have are those which help them build things, guard their place, make trips, and live together.

# 3 Animals can learn, too!

If you have ever watched a newborn puppy, you know it can do very little. But it can do some things. As soon as it is born, it can snuggle to its mother to get warm. And it knows by instinct how to get food from its mother.

But a puppy soon *learns* to do many things. That is, it finds out how to do things it could not do before. It learns how to find its way back to its "home" corner if put into another corner. It learns to play with a ball. What other things might a puppy learn?[1]

[1] **Sample answer:** To come when called. To do tricks.

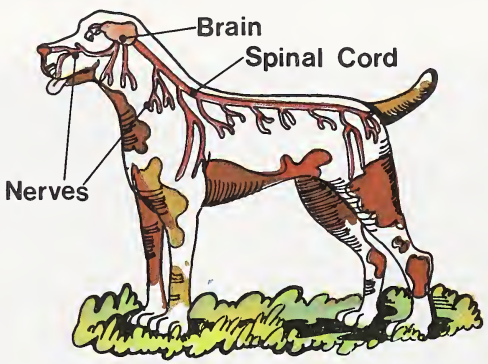
*What things do you think this newborn lamb will have to learn?*



**Main concepts of the chapter (pages 53–59):**
Learning is finding out how to do things that you could not do before.
The senses, nerves, and brain help an animal learn.
Animals learn in many ways.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—define by example what learning is;
—state an example of how the senses, nerves, and brain help an animal learn;
—list four ways in which animals learn and give an example of each way.
**Important words:** learn, senses, nerves, brain.
**Sample answer for the caption:** How to walk and how to protect itself.

## What the senses, nerves, and brain do

Many parts of the body help an animal to learn. What if you gave a puppy something new for supper. First, it would *smell* the food. Messages about how it smells would be sent along a nerve from the nose to the brain. Then, the puppy would *taste* the food. Messages about how it tastes would be sent along a nerve from the tongue to the brain.




Smelling and tasting are senses which help the animal learn about this new food. The next time it is given that food, the puppy will remember if it likes the food or not. What other senses might help animals learn?[1]

Do you think all animals can learn?[2] Which animals seem to learn better than others? Why do you think this is so?[3]

[1] **Sample answer:** Their sense of sight, hearing, and touch.

[2] **Sample answer:** Yes.

[3] **Sample answers:** Cats and dogs. Because they probably have a bigger brain and more senses than some other animals.



**Suggested discussion:** After discussing "What the senses, nerves, and brain do," you may wish to discuss with the children the importance of their senses. To begin the discussion, you might ask the following questions: What senses do you have? (Sample answer: Sight, smell, taste, touch, and hearing.) Do you think your senses are important to you? Why are they important? (Sample answers: Yes. If I did not have them, I would not know about anything happening around me.)

## How animals learn

Animals learn about things in many ways. What ways can you think of that animals learn? [1]

*Watching others.* As you may know, some animals must hunt for their food. Young lions watch their mothers hunt for food. They see the best ways to catch another animal. When they get older, they know how to hunt. They have learned by watching their mothers hunt.

What else might animals learn by watching others? [2]

What have you learned by watching others? [3]

[1] **Sample answer:** By watching other animals and by trying to do something one way, then another.

### Exploring on Your Own

Watch someone tie his tie. What does he do first? Try following the steps. See if you can learn to do it just by watching him.

[2] **Sample answer:** How to protect themselves.

[3] **Sample answer:** How to tie my shoelaces and how to throw a ball.

*These cougar cubs are getting a lesson in hunting. What are some things you think they must learn about hunting?*

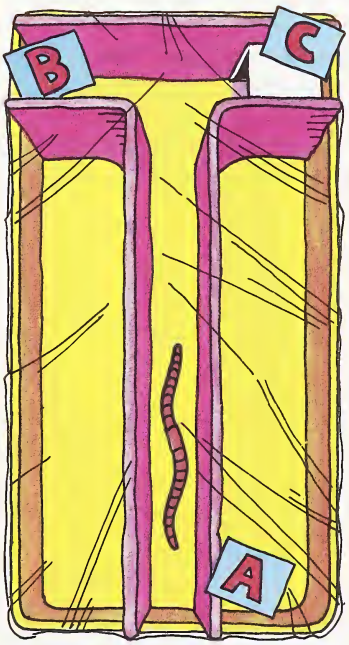


**Sample answer for the caption:** They must learn which animals they can catch and which they cannot. They must learn how to get close enough to an animal to catch it without being seen, heard, or smelled.

***Trying one way, then another.*** Animals also learn by trying things out. An ant may not be able to find its way back to its nest. Someone may have cleaned around the nest. This may erase the trail that the ant has left. It has to try new ways to get home. It will try one way, then another. At last it may find its nest.

What have you learned by trying something one way and then another?[1]

[1] **Sample answer:** Finding my way to and from school and putting a jigsaw puzzle together.




## FINDING OUT

**Can an earthworm learn to find its way home?**

*You will need: earthworm, tray, clear food wrap, clay, small note card, paper towel*

- Using the clay, build a path for the worm in the tray as shown.
- Make a house for the worm out of the note card.
- Put the worm at A. Put the house over it.
- To begin, move the house to C. Quickly cover the tray with food wrap.
- Find out how many times it takes the worm to find its home at C. Let the worm rest on a wet paper towel 5 minutes after each run.

*Did your worm learn to find its way home? If so, how do you know?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring, collecting data, communicating.
*Sample findings:* The children will most likely observe that after a few trials, the earthworm will find its home. The children may infer from their observations that the earthworm has learned to find its home when the earthworm crawls from "A" to "C" without turning toward "B."

***Doing things over and over.*** Another way animals learn is by doing something over and over. When a squirrel opens its first nut, it is hard work. After opening many nuts, the squirrel finds the best way to open a nut. Then it is easy for the squirrel.

What other things do animals learn by doing them over and over? [1]

What have you learned by doing something over and over? [2]

***Learning one thing because of another.*** As you may know, animals get their food in many ways. Toads like to catch flies. There is a fly that looks just like one kind of bee. It is the robber fly. If a toad eats a robber fly, it has a good dinner. But if it tries to eat a bee, it gets stung. Toads stay away from bees. Some toads also stay away from robber flies. Why might this be so? [3]

## For You to Think About

You may have heard that people sometimes learn from their mistakes. What have you learned in this way?

[1] **Sample answer:** A dog may sit up and a parrot may speak.

[2] **Sample answer:** Brush my teeth, comb my hair, and write my name.

[3] **Sample answer:** Because they were stung trying to eat a bee which looks like a robber fly.

*In what ways does the robber fly on the left look like the bees on the right?*

**Sample answer for "For You to Think About":** How to ride a bicycle.

**Sample answer for the caption:** It has big eyes and is about the same colour and size as the bees.

Many times, a dog will know which cupboard its food is kept in. What if someone opens the door of that cupboard. The dog will get excited and wag its tail. It will do these things even before it sees or smells the food! The dog has learned that when the door is opened, "dinner" is coming.

What things have you learned because of something else?[1]

[1] **Sample answer:** I have learned that when I feel heat coming from something, I should not touch it.

## FINDING OUT

**How can a fish learn to do one thing because of another?**

*You will need: 2 or 3 fish in a bowl of water, fish food*

- Tap the side of the bowl 3 times.

*What, if anything, do the fish do?*

- Just before you feed the fish each day, tap the bowl 3 times.
- Do this for about 10 days.
- On the eleventh day, tap 3 times on the bowl. But do not feed the fish.

*What do the fish do? Why?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, experimenting, inferring, communicating.
*Sample findings:* The first time the children tap the bowl, the fish may move about in any direction or stay still. After the children have fed the fish and tapped the bowl at the same time for about ten days, the children will notice a change in the behaviour of the fish. The children will most likely observe that tapping on the bowl will cause the fish to swim to the surface. The fish will swim to the surface because they have learned that the tapping means they are about to be fed.

***Working out problems.*** Some animals can learn by working out problems. The picture on this page shows a dog that cannot get to its food. Some dogs can work out a way to get to the food. They can see they must back up and go around the post. What else might they try to do to get the food?[1]

Though some animals can work out problems, people are better at doing this. You can do puzzles. You can do math problems. What games do you play in which you have to work out problems?[2]

[1] **Sample answer:** Try to break the leash or try to pull the stick out of the ground.

[2] **Sample answer:** Checkers, cards.

## *A Second Look*

1. What is learning?
2. What parts of the body help an animal to learn?
3. What are some ways animals learn?



**Sample answers for "A Second Look":** 1. Learning is finding out how to do things you could not do before. 2. The senses, nerves, and brain are parts of the body that help an animal learn. 3. Animals learn by watching others, by trying one way and then another, by doing things over and over, and by solving problems. Animals may also learn one thing because of another.

## Workers Who Use Science

Many people like to watch how animals behave. There are some workers who must know much about animal behaviour. One such worker is the *animal keeper* at the zoo.

An animal keeper must know how much light, heat, and water each kind of animal needs. For example, some animals like to stay in a dark place for part of the day. An animal keeper must be sure these animals have such a place to go.

An animal keeper must also know about an animal's instincts. The keeper must know that putting two male birds of the same kind too close together might make them fight. What other instincts must the animal keeper know about?

To find out more about animal keepers, try to find the answers to these questions:

What else must animal keepers know about animal behaviour?[1]

How do animal keepers feed many kinds of animals such as giraffes and elephants?[2]

What things might an animal keeper do to help a sick animal?[3]

Along with sources of your own, the following book might be helpful: *Childcraft—The How and Why Library,* Volume 5, *About Animals.* Don Mills, Ontario: Addison-Wesley (Canada) Ltd. pp. 256—273.

**Sample answers for "Workers Who Use Science":**

[1] Animal keepers must know which kinds of animals live together and which do not. Animal keepers must also know which animals need a large area to live in and which do not.

[2] Animal keepers feed giraffes by hanging the food in trees or on tall poles. Elephants are fed by spreading the food out on the ground.

[3] An animal keeper might give a sick animal medicine. An animal keeper might also look for things in the animal's environment that may have caused the illness.

## Reviewing the Main Ideas

The way an animal acts is called its behaviour.

Things around an animal such as light, heat, and water may make an animal behave as it does.

An instinct is the ability to do something without having to learn how.

Animals may have an instinct for building things, guarding their place, traveling, or living together.

Learning is finding out how to do things that you could not do before.

The senses, nerves, and brain help an animal learn.

Animals learn in many ways.

## Reading About Science


Bendick, Jeanne. *How Animals Behave.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1976.

Clarkson, Ian N. *Tricks Animals Play.* Toronto, Ontario: Visual Education Centre, 1975.

Cosgrove, Margaret. *Wintertime for Animals.* Toronto, Ontario: Dodd, Mead & Company (Canada) Ltd., 1975.

Hopf, Alice L. *Biography of an Ant.* Don Mills, Ontario: Longman Canada Limited, 1974.

McInnes, John and Murray, William. *Migration.* Don Mills, Ontario: Thomas Nelson & Sons (Canada) Ltd., 1975.




**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 62.

**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of animal behaviour. Such articles might be found in reference books under the headings *imprinting, pecking order,* and *animals.*

# Testing for Understanding

**Ideas to Check**

On your paper write *T* for each sentence below that is true. Write *F* for each one that is false.

T 1. Water sometimes makes animals behave as they do.
T 2. Some animals know how to build homes without having to learn how.
F 3. Cockroaches like light.
T 4. An instinct helps some animals travel.
T 5. Warm air makes crickets chirp faster than cool air.

Write on your paper the word that best fits in each blank below. Choose from these words: *brain, senses, instinct, nerves, behaviour, learning, light.*

1. The way an animal acts is called its ____.
2. The ability to do something without having to learn how is called an ____.
3. Finding out how to do something you could not do before is called ____.
4. Smelling and tasting are ____ which help animals learn.
5. Messages go to the brain along ____.

**Words to Use**

behaviour
instinct
learning
senses
nerves



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Animal Behaviour" are provided for you on page T17 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional test questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**What Am I?**

I am a pupil that never learns, but I behave well without a teacher.

**Fun with Words**

A turtle named Myrtle
Went over a hurdle.

A snake they called Jake
Could not stay awake.

Try to make up some other jingles. They should tell about animal behaviour.

**Things to Do**

1. Collect about 10 ants. Place them in a shoe box without a lid. Darken the room and turn on a flashlight. Shine the light on the ants. Watch how the light makes the ants behave.

2. Find out if some of the birds near you go away for the winter. If they do, try to find out when and where they go. Find out when they come back. Keep a chart of other interesting things you find out about them.

3. Visit a pet store or watch some fish in an aquarium. See how some fish guard their place in the water. If you are in a pet store, watch the behaviour of other animals in the store.

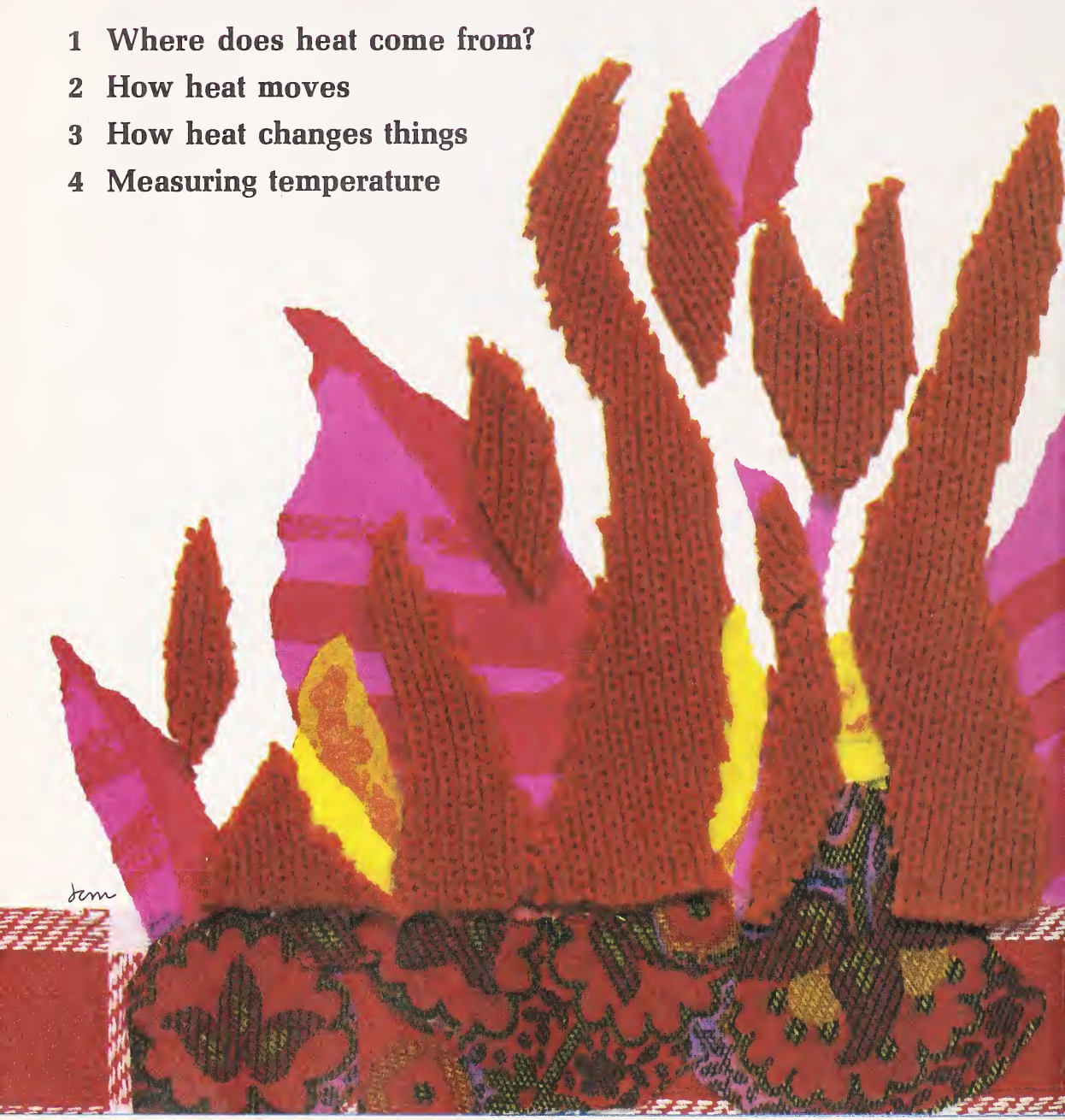


**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Animal Behaviour." You may also wish to encourage the children to make up additional activities related to the topic of animal behaviour.

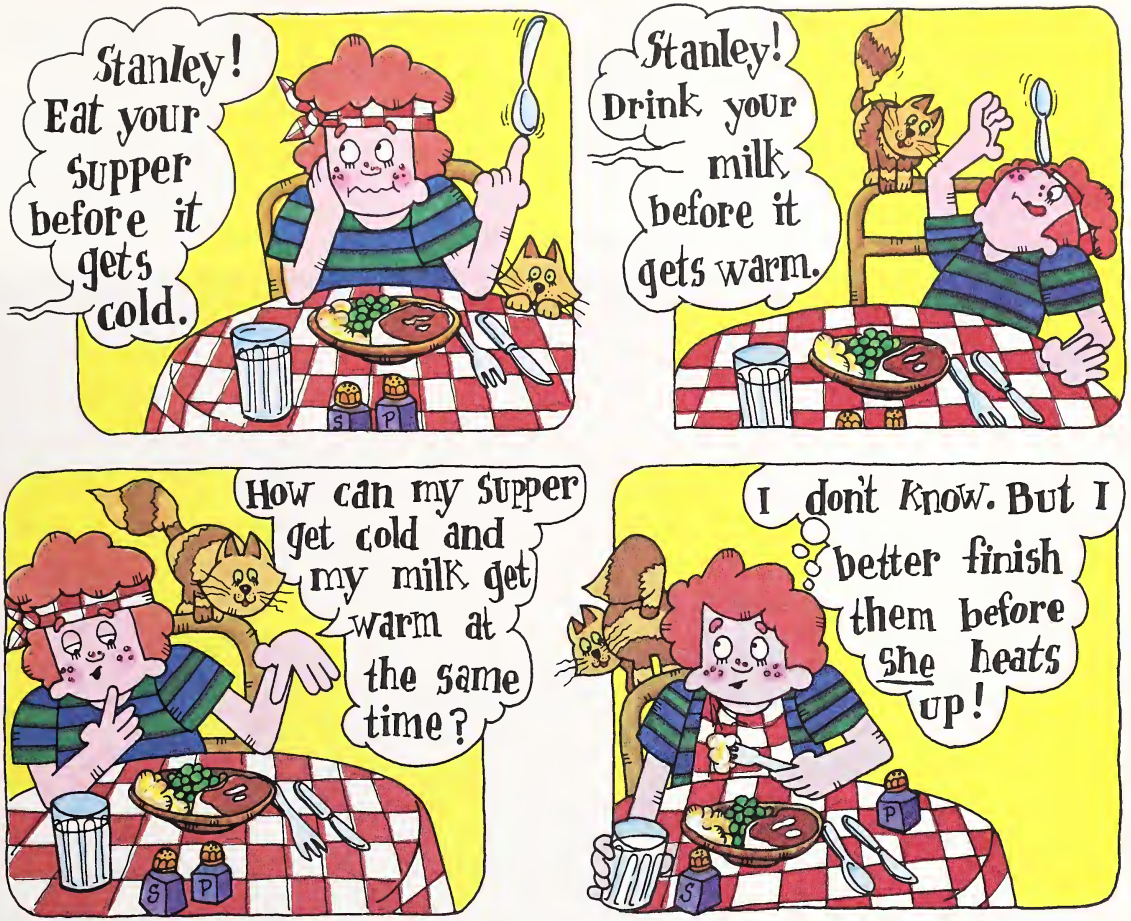
**Answer for "What Am I?":** A pupil in an animal's eye.

# 3 Heat and Temperature





**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see page T13 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 67, 74, 76, 77, 84, 86, and 89.




What might make Stanley's supper get cold?[1]

What might make Stanley's milk get warm?[2]

What other things do you know of that might become cold or warm? Why might they become cold or warm?[3]



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have the children read the questions below the cartoon and discuss their answers to the questions.

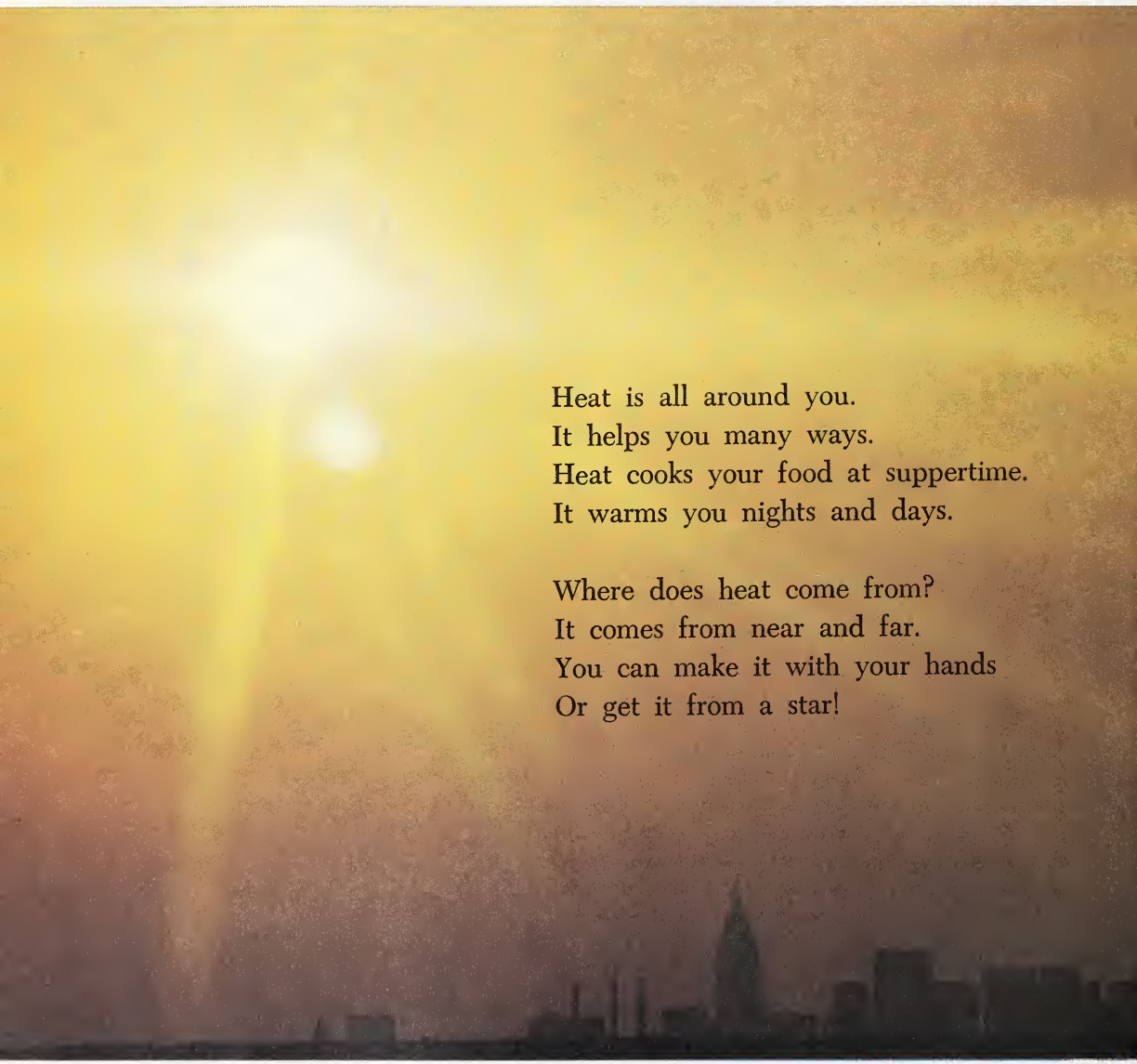
**Sample answers for questions below the cartoon:**

[1] Stanley's supper might get cold because the air around the food is cooler than the food, so the air cools the food. (The food loses heat.)

[2] Stanley's milk might get warm because the air around the milk is warmer than the milk, so the air warms the milk.

[3] My bathwater sometimes gets cold because the tub and the air around the water is cooler than the water. My ice cream sometimes gets warm because the air around it is warmer than the ice cream.

# 1 Where does heat come from?



Heat is all around you.
It helps you many ways.
Heat cooks your food at suppertime.
It warms you nights and days.

Where does heat come from?
It comes from near and far.
You can make it with your hands
Or get it from a star!

**Main concepts of the chapter (pages 66–72):**
Heat comes from the sun, rubbing, electricity, the earth, and burning.
Heat helps people in many ways.
**Performance objective:** After studying the information provided in this chapter, the children should be able to
—identify at least three sources of heat.
**Important words:** sun, rubbing, burning, electricity, volcano, geyser.

## Heat from a star

The poem on page 66 says many things about heat. One thing it says is that heat can come from a star. That star is the sun. When do you feel heat from the sun?[1]

As you may know, the sun can heat many things. It can heat the earth. It can heat the air around you. Why do you think this is important?[2]

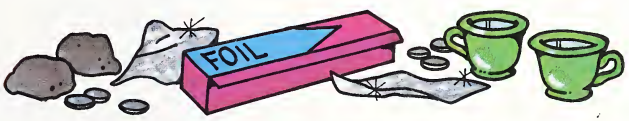
[1] **Sample answer:** When you are outside, especially on sunny days.

[2] **Sample answer:** If there were no heat from the sun, the earth and the air would be too cold for anything to live.

## FINDING OUT

**How can you tell that heat comes from the sun?**

*You will need: 3 or 4 pairs of small things such as rocks, pieces of aluminum foil, and cups of water*




- Place one thing from each pair in the sunlight.
- Place the other thing from each pair in the shade. Keep all the things away from heaters.
- After about an hour, feel each pair of things.

*Which things are warmer—the ones in the sunlight or the ones in the shade? Why?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children will most likely observe that the things placed in the sunlight were warmer than the things placed in the shade. The children may infer from this that heat from the sun made the things placed in the sunlight warmer than the things placed in the shade.
**Suggested research and discussion:** After discussing "Heat from a star," you may wish to have the children find out about how heat from the sun can be used to heat homes and other buildings. For them to do this, have the children use reference books. Have them look under the headings *sun* and *solar heat*. You might then have the children discuss their answer to this question: Why might being able to use heat from the sun to heat homes and other buildings be important to people? (Sample answer: It is important because people need to save fuels such as oil and gas.)

## Exploring on Your Own

Sometimes you may want heat that is made from rubbing. On a cold day, you might rub your hands to get them warm. But sometimes heat from rubbing is not wanted. Find out when heat from rubbing is not wanted. You may want to use reference books to help you. Look under the heading *heat* or *friction*.

## Heat from rubbing

Rub your hands together about ten times. Rub hard and fast. Feel the heat!

Try rubbing other things together. Which of these things can make heat when they are rubbed? What other things do you think can make heat when they are rubbed?[1]


[1] **Sample answer:** Almost anything can make heat when rubbed against something else.



**Sample finding for "Exploring on Your Own":** I would not want my shoes to rub against my feet because that would make heat and could make blisters. People who work with machines do not want the parts of these machines to rub against one another because if this happened, the parts could become so warm that the machines would not work.

**Suggested activity:** After discussing "Heat from rubbing," you may wish to have the children discover that rubbing can make more heat than they might think. For them to do this, the children will need two balloons. Have the children blow up the balloons and tie the neck of each shut. Then have them rub one balloon against the other. After one balloon pops, you might want to ask the children this question: Why did rubbing the balloons together make the one balloon pop? (Sample answer: Because rubbing them together made one balloon so hot that part of it melted.)

## Heat from electricity

Think about some things that make heat in your home. A toaster makes heat to toast your bread. An iron makes heat to iron your clothes. How do you think toasters and irons make heat? [1]

Toasters and irons must be plugged into an outlet to work. They must be plugged in to get *electricity* [ih-LEHK-TRIHS-uht-ee]. It is this electricity that makes heat. Look at the picture below to see how this happens.

What other things do you know of that make heat from electricity? [2]

[1] **Sample answer:** By using electricity.

[2] **Sample answer:** Hair dryers, some clothes dryers and stoves.

*Toasters and irons have special wires in them. When electricity passes through these wires, they get hot. How might you know when toasters and irons are hot?*



**Sample answer for the caption:** When I put my hand close to them and feel heat coming from them.

## Exploring on Your Own

You may have read about the heat around you. Your body also has heat. This heat comes from inside your body. Find out how your body makes heat. Also find out why this heat is important. You might ask a doctor or your school nurse to help you.

### Heat from burning

Look at the pictures below and on the next page. Which of the things shown are giving off heat? Why?[1]

Heat from burning is used in many homes. How might people use this heat in their homes?[2]

Heat from burning is also used in factories. It is used to make many things. Steel for cars is made by using heat from burning. Windows are also made by using heat from burning. What other things do you know of that are made by using heat from burning?[3]

[1] **Sample answers:** The candles, the wood in the fireplace, and the grass in the forest are giving off heat because all these things are burning. The steel is giving off heat because some of the ingredients in the steel are burning.

[2] **Sample answer:** To heat their homes. To cook their food.

[3] **Sample answer:** Dishes, pots, pans, metal parts of furniture, things made from plastic.



**Sample findings for "Exploring on Your Own":** My body makes heat by burning the food I eat. The heat my body makes is very important to me because my body needs this heat to work properly.

*In a geyser (left), heat from the earth forces water and steam through a hole in the earth. In a volcano (right), heat forces gases and melted rock through a hole in the earth. Which do you think is hotter? Why?*

## Heat from the earth

As you may know, most heat comes from above the ground. But some heat comes from deep inside the earth.

Heat from the earth sometimes comes up through openings in the ground. One kind of opening is called a *volcano* [vahl-KAY-noh]. Another kind is called a *geyser* [GY-zur].

People can use this heat from the earth. It can be used to make electricity. Why might this be important?[1]

[1] **Sample answer:** Because people will probably always need to use electricity.

### *A Second Look*

1. What are some ways in which heat is important?
2. How can you make heat with your hands?
3. What are volcanoes and geysers?



**Sample answers for the caption:** The melted rock is probably hotter. Because it would take more heat to melt rock than to change water into steam.
**Sample answers for "A Second Look":** 1. Heat is important to me because it helps me cook my food, stay warm, and make many things I use every day. 2. I can make heat with my hands by rubbing them together very hard and fast. 3. Volcanoes and geysers are openings in the ground, through which heat escapes from deep inside the earth.

# 2 How heat moves

Think about a warm, sunny day. If you were in sunlight, you might feel warm. But suppose you were to walk into the shade. Do you think you would become cold? Why or why not?[1]

[1] **Sample answers:** No. The air in the shade would be warm because of the warm air around it.

## Heat moves in air

You may not always be in sunlight or near other things that give off heat. But you can still feel heat from these things. Heat can move in air. Why do you think this is important?[2]

[2] **Sample answer:** So that you don't have to be near a source of heat to feel the heat.



**Main concepts of the chapter (pages 73–79):**
Heat moves in air.
Warm air rises, while cold air moves down.
Heat can move through objects.
Heat can move from one object to another.
There are many things you can use to keep heat from moving.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—give an example which demonstrates that heat moves in air;
—show that warm air rises;
—demonstrate that heat can move through objects;
—demonstrate that heat can move from one object to another;
—give two examples of things they can use to keep heat from moving.

**Important word:** heat.

## FINDING OUT

**Where does the heat from a candle go?**

*You will need: candle, candleholder, matches*

- Place the candle in the holder. Be sure it is held tightly in place.
- Light the candle.
- Place your hand below the flame as shown.
- Place your hand next to the flame as shown.
- Place your hand above the flame as shown.

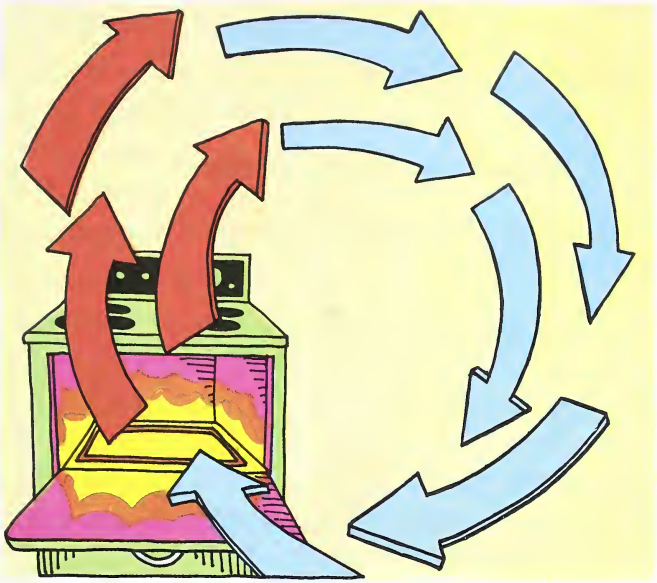
*Where did you feel the most heat? Why?*

Think about your kitchen when the oven is turned on. Heat from the oven warms some of the air around it. As this air becomes warm it rises.

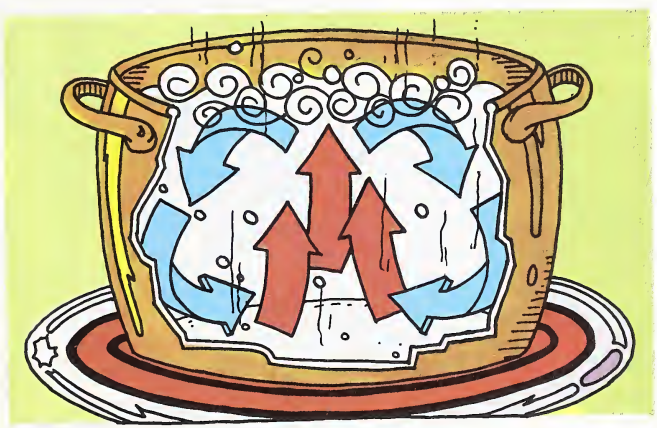
As the warm air rises cool air in the room moves down. It also moves to the oven. This cool air then becomes warm and rises. In this way, heat from the oven keeps moving to other parts of the room. Look at the first drawing on page 75 to see how this happens.



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children may state that they felt the most heat when their hand was above the candle. They may infer from this that heat rises.



*Heat makes water in the pan below move in the same way it makes air in the room above move. As water is heated (red arrows), it rises. The cooler water (blue arrows) moves down. How do you know when all the water is heated?*



## For You to Think About

If you were to look in many rooms, you would find that the heat most often comes from a place in the floor or close to the floor. Why do you think this is so?

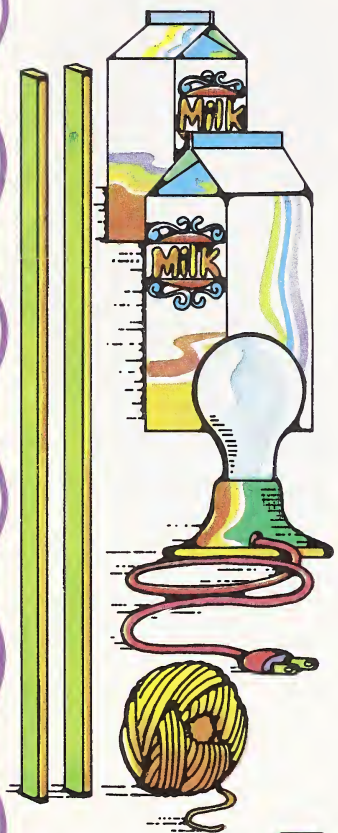


**Sample answer for the caption:** When the water begins to boil.

**Suggested activity:** After looking at and discussing the pictures above, you might have the children try the following activity to observe that hot water rises and cool water moves down. For them to do this, have the children place a pan of water on a hot plate and begin heating the water. Then have them put some very small pieces of paper in the water. Then ask these questions: What happened to the pieces of paper? Why? (Sample answers: They fell to the bottom of the pan. Then they came to the surface and fell to the bottom again in a circular pattern. They did this because the pieces of paper were carried to the surface by the rising, warm water and fell to the bottom as the cool water moved down.)

**Sample answer for "For You to Think About":** So the warm air will heat the room as it rises.

# FINDING OUT

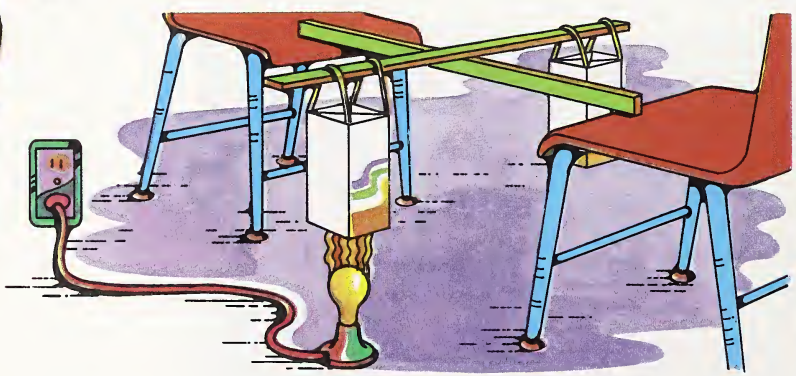



**How can you show that warm air rises?**

*You will need: 2 milk cartons, string, 2 wooden bars, electric lamp*

- Cut the tops off the milk cartons.
- Hang the cartons upside down as shown.
- Make the bar with the cartons balance on the second bar.
- Turn on the lamp.
- Heat the open bottom of one of the milk cartons with the light bulb. This will warm the air inside the carton.

*Do the cartons still balance?*
*If not, which carton moves up? Why?*





**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children may observe that in time the cartons no longer balanced and that the carton with the warm air inside moved up. They may infer from this that since warm air rises, the warm air in the carton caused the carton to move up. The children may also observe that the other carton moved down. They may then infer that the warm air in the first carton was lighter.

**Suggested research and activity:** After the children have completed the "Finding Out," you may wish to have them find out how people used the principle of warm air rising to travel in large balloons. Have the children look under the heading *balloon* in reference books. You might then have the children draw pictures of these balloons and tell about some of the things people used these balloons for.

## Heat moves through objects

Have you ever cooked something in a pan? If so, you may know that the whole pan does not become warm right away. First, the bottom of the pan gets warm. Then, heat moves through the bottom to the sides. Heat may even move through the sides to the handle.

What are some other objects you know of that heat can move through?[1]

Heat can also move from one object to another. If you put a hot cup of soup on a table, heat from the cup would move to the table. At what other times might heat move from one object to another?[2]

[1] **Sample answer:** Through metal knives, forks, spoons. Through glass plates, dishes, cups.

[2] **Sample answer:** When boiling an egg. When ironing something.

## FINDING OUT

**How does heat move through a coat hanger?**

*You will need: candle, matches, coat hanger, aluminum foil.*

- Support the hanger above the candle as shown.
- Drip candle wax on the hanger in 3 or 4 places.
- Light the candle. Heat one end of the hanger.

*Does heat move through the hanger? If so, how can you tell where the heat has moved?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring.
*Sample findings:* The children will most likely be able to trace the heat moving through the hanger by watching the wax melt. The wax closest to the candle will melt first, while the wax farthest away will melt last.

## Exploring on Your Own

Some things are better than others in keeping heat from moving. Find out which of these things might be used to keep heat from moving: water, metal, rubber, glass, cement, cloth, air, and wood. You may wish to use reference books. Look under the heading *heat insulation* or *heat conduction*.

## Keeping heat from moving

When you are cold, you may want heat to move. You may want it to move from a heater to you. When else might you want heat to move? [1]

Sometimes, however, you may want to keep heat from moving. If you put a hot pan on a table, what might happen to the table? Why? [2] At what other times might you want to keep heat from moving? [3]

There are many things you can use to keep heat from moving. Suppose you wanted to pick up a hot pan. What things might you use to keep the heat from burning your hand? [4]

[1] **Sample answer:** When it is too hot or too cold in my room.

[2] **Sample answers:** It might burn the table. Because heat can move from one object to another.

[3] **Sample answer:** When I am riding in a car or sitting in my home during the winter.

[4] **Sample answer:** A pot holder. A thick towel.

*These children are wearing clothing that keeps heat from moving. Where is the heat coming from that is keeping them warm? How else does their clothing help keep them warm?*



**Sample finding for "Exploring on Your Own":** Rubber, cloth, and wood might be used to keep heat from moving. Air between windows and walls also helps keep heat from moving.

**Sample answers for the caption:** The heat is coming from inside their body. The clothing keeps their body from being exposed to the snow and the cold air.

People who build homes and other buildings know how to keep heat from moving. They know how to make buildings so that heat does not move through the walls. When would you want heat to stay inside a building?[1] When would you want heat to stay outside a building?[2]

[1] **Sample answer:** When it is cold outside.

[2] **Sample answer:** When it is hot outside.

*Between the inside and outside walls of this building is a layer of insulation. How does the insulation help keep air inside the building comfortable in summer and winter?*

## *A Second Look*

1. How do warm air and cool air move in a room?
2. What are some objects heat can move through?
3. When might you want to keep heat from moving?



**Sample answers for "A Second Look":** 1. In a room, warm air rises and cool air moves down. 2. Heat can move through a pan, a cup, and a dish. 3. I might want to keep heat from moving when I am playing outside in the winter and when I want to pick up a hot pan.

**Sample answer for the caption:** In the summer, the insulation keeps the hot air outside from moving into the building. In the winter, the insulation keeps the warm air inside from moving out of the building.

# 3 How heat changes things

Think about the last time you put butter on a hot roll. Heat from the roll warmed the butter. How did the butter change when it became warm? [1]

Heat can change other things too. What other things have you seen changed by heat? How have they changed? [2]

[1] **Sample answer:** It melted.

[2] **Sample answers:** I've seen snow and ice melt. I've seen water boil.



**Main concepts of the chapter (pages 80–84):**
Heat can melt and boil some things.
Most objects take up more room when they are warm than when they are cool.
**Performance objective:** After studying the information provided in this chapter, the children should be able to
—identify by example three different ways in which heat can change some things.
**Important words:** melting, boiling.

## Heat melts things

Suppose you held some ice in your hand. Heat from your hand would change the ice. The ice would change to water. This kind of change is called *melting*.

Heat can melt many things. What are some other things you can think of that heat can melt? [1]

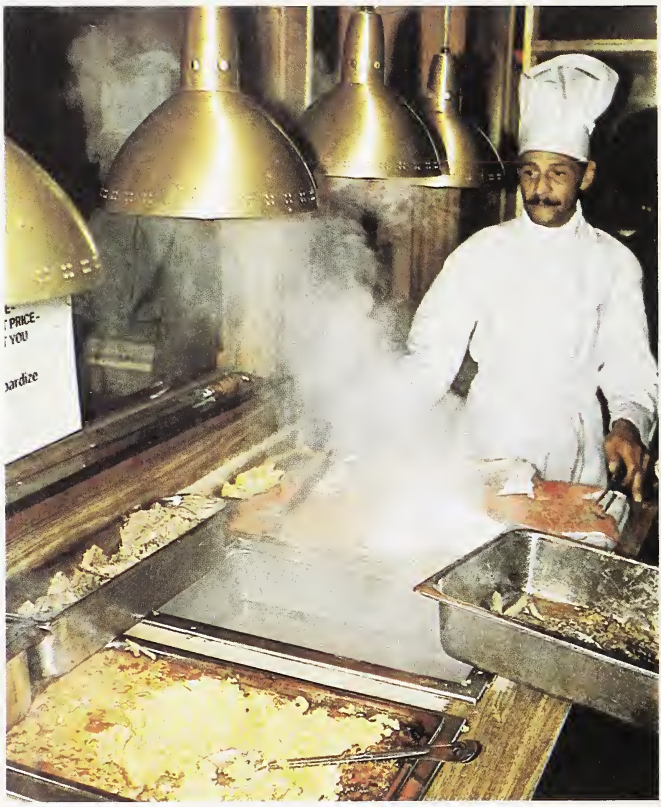
[1] **Sample answer:** Marshmallows, ice cream, chocolate, candles.

## Heat boils things

There is another way in which heat can change things. Suppose you were heating some water on a stove. If you were to add enough heat, the water would change to steam. This kind of change is called *boiling*.

Heat can boil other things too. What are some other things you can think of that heat can boil?[1]

[1] **Sample answer:** Soup, milk.



*In what ways is food being kept warm in this picture? What are some other ways in which people might keep food warm?*



**Sample answers for the caption:** The food is being kept warm by steam and by lights. Some other ways people can keep food warm are by putting it in a warm oven or by putting it in an insulated container.

## Heat makes things take up more room

Have you ever played on a sidewalk? If so, you may have seen spaces, or cracks, every few feet. People who build sidewalks leave these spaces. These people know that a sidewalk takes up more room when it is warm than when it is cold. The spaces in a sidewalk allow for it to take up more room on a hot day.

There are many other things which take up more room when they are heated. Which of these things can you think of?[1]

### For You to Think About

What do you think might happen to a sidewalk on a hot day if builders had not left spaces in it? Why?

[1] **Sample answer:** A cake takes up more room after it is heated and baked. Air takes up more room when it is heated.

*The spaces in this bridge allow the bridge to take up more room when it becomes heated. What things do you think cause the bridge to become heated?*



**Sample answer for "For You to Think About":** The sidewalk would probably break into pieces because there would be no room for the sidewalk to expand when it became heated.

**Sample answer for the caption:** The sun and the traffic would probably cause the bridge to become heated.

# FINDING OUT

**Does heat make air take up more room?**

*You will need: 2 empty soda bottles, pan of water, source of heat, bowl of ice, 2 balloons*

- Put the balloons over the necks of the bottles.
- Place one bottle in the pan of water. Heat the water.
- Place the other bottle in the bowl of ice.

*What happens to the air in each balloon? Why?*

## *A Second Look*

1. In what ways does heat change things?
2. How does ice change when it melts?
3. How does water change when it boils?



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children may observe that the balloon on the bottle sitting in ice shrinks or does nothing. But the balloon on the bottle sitting in hot water begins blowing up. The children may infer from this that since no air is added or taken away from either balloon, heat must make air take up more room.
**Sample answers for "A Second Look":** 1. Heat can change things by melting them, by boiling them, or by making them take up more room. 2. Ice changes to water when ice melts. 3. Water changes to steam when water boils.

# 4 Measuring temperature

Suppose you got letters from two friends. One friend was in Nassau. The other was in Inuvik. They both wrote telling you that it was a cold day. What if they both wanted to go outside. Do you think one would put on more clothing than the other? Why or why not?[1]

[1] **Sample answers:** Yes. My friend in Inuvik would put on more clothing because cold weather in Inuvik is much colder than cold weather in Nassau.



**Main concepts of the chapter (pages 85–91):**
The temperature of something tells you just how hot or cold it is.
Temperature is measured in degrees.
The best way to measure temperature is to use a thermometer.
**Performance objective:** After studying the information provided in this chapter, the children should be able to
—measure the temperature of some things by using a thermometer.
**Important words:** measure, temperature, degrees, Celsius, thermometer, liquid.

## What is temperature?

You most likely use words like "hot" and "cold" to tell about many things. Feeling something with your hands is one way of telling whether it is hot or cold. This is one way to *measure* [MEHZH-ur] how hot or cold something is. But things which feel hot to you may not feel hot to someone else. And things which feel cold to you may not feel cold to someone else. Why might this be so?[1]

[1] **Sample answer:** Because some people are more sensitive to hot and cold objects than other people are.

## FINDING OUT

**Does warm water always feel warm?**

*You will need: 3 flat pans*

- Fill one pan with hot water. (Not *TOO* hot)
- Fill another pan with cold water.
- Fill the last pan with warm water.
- Put one hand in the hot water and the other hand in the cold water.
- After about 3 minutes, put both hands in the warm water.

*Does the water in the third pan feel the same to both hands? If not, which hand feels warm? Why? Which hand feels cool? Why?*



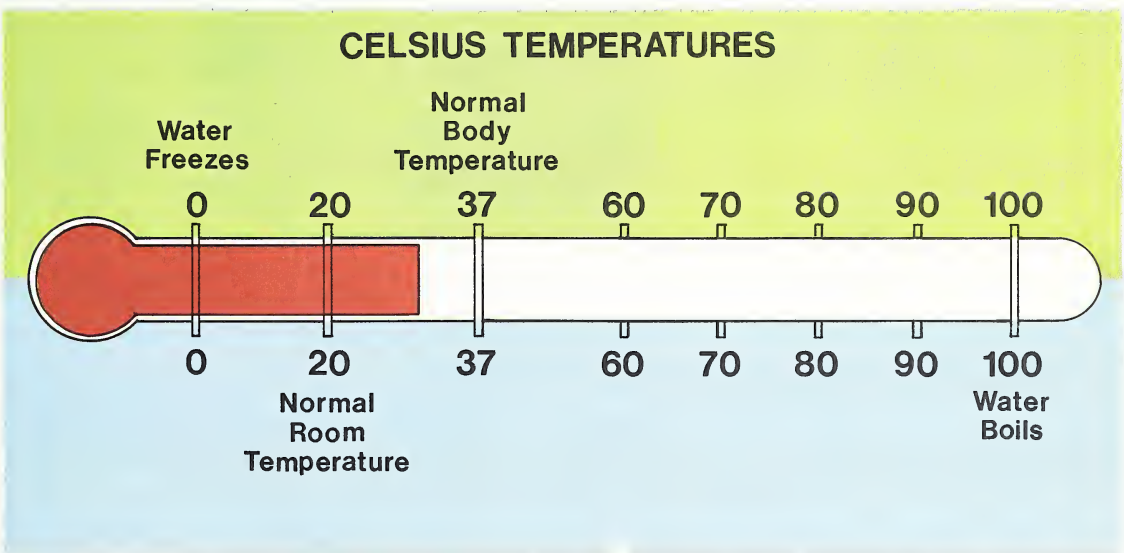
**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children may observe that the water in the third pan does not feel the same to both hands. They probably will state that one hand now feels cool because it was first in hot water. The other hand now feels warm because it was first in cold water.

If you wanted to know just how hot or cold something is, you would have to find out its *temperature*. The temperature of something tells you just how hot or cold it is.

Temperature is measured in *degrees* [dih-GREEZ]. Something that is hot will measure more degrees than something that is cold.

When you are well, your temperature is about 37°C. The drawing on this page shows what is meant by Celsius. Water boils when its temperature is 100°C. What do you think is the temperature of the air around you?[1]

[1] **Sample answer:** It is probably about 20°C.






**Suggested discussion:** After completing the "Finding Out" on page 86, you might point out the following situation to the children: When people go swimming on a very hot day, the people who have been in the water for a while often say the water is warm. But the people who are just getting into the same water often say the water is cool. Then you might ask the children why they think some people would say the water was warm and others would say the water was cool. (Sample answer: The people who have been in the water have got used to the water temperature. Those who are just getting into the water are used to the warm air, so the water feels cool to them.)

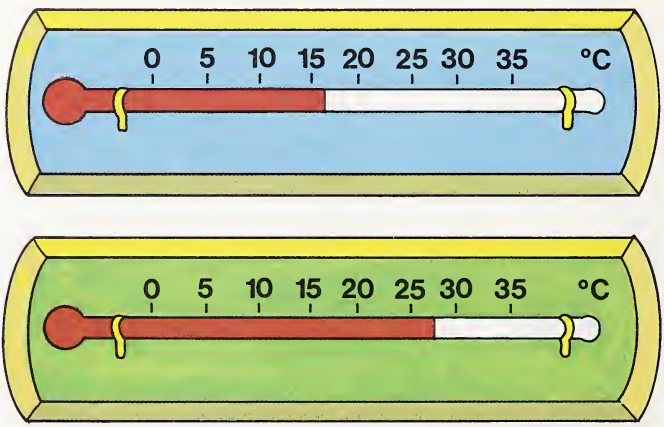
## What is a thermometer?

The best way to measure temperature is to use a *thermometer* [thuh(r)-MOM-uht-ur]. Look at the thermometers pictured on this page. These thermometers show the air temperature of two rooms. You can read each thermometer by finding where the top of the red line ends. What number is at the end of each red line?[1] Which room is the warmer?[2]

[1] **Sample answer:** About 17°C. About 28°C.

[2] **Sample answer:** The room temperature measured by the bottom thermometer.

*The symbol °C is often used to show degrees Celsius. Why do you think this symbol is used instead of the words?*




The red line in these thermometers is a red *liquid* [LIHK-wuhd]. This liquid is in a glass tube. When these thermometers were made, the liquid was put in the bulb at the bottom of each tube.

When heated, the red liquid in a thermometer is like most other things. That is, it will take



**Sample answer for the caption:** Less space is needed to write something when symbols are used instead of words.

**Suggested activity and discussion:** After completing the "Finding Out" on page 89, you might have the children measure the temperature of places in the classroom, such as near the floor, the ceiling, or a window. Then ask them these questions: Is every place in the classroom the same temperature? If not, why not? (Sample answers: The temperature near the ceiling is probably a few degrees higher than that near the floor and the window. This would be so because heat rises. The temperature near the window could be higher or lower, depending upon the temperature of the air outside.)

up more room when it is warm than when it is cool. So, when the red liquid is heated, it will rise in the tube. When the red liquid is cooled, it will fall in the tube.

## FINDING OUT

**Can you "watch" the temperature of things change?**

*You will need: 3 jars, 4 thermometers*

- Write down the temperature of each thermometer.
- Fill one jar with hot water, one with ice water, and one with warm water.
- Put one thermometer in each jar. Leave one thermometer out in the air.
- Write down the temperature of each thermometer every 3 or 4 minutes. Do this for about 15 minutes.

*How did each thermometer change?*
*Which one shows the highest temperature? Why?*
*Which one shows the lowest temperature? Why?*

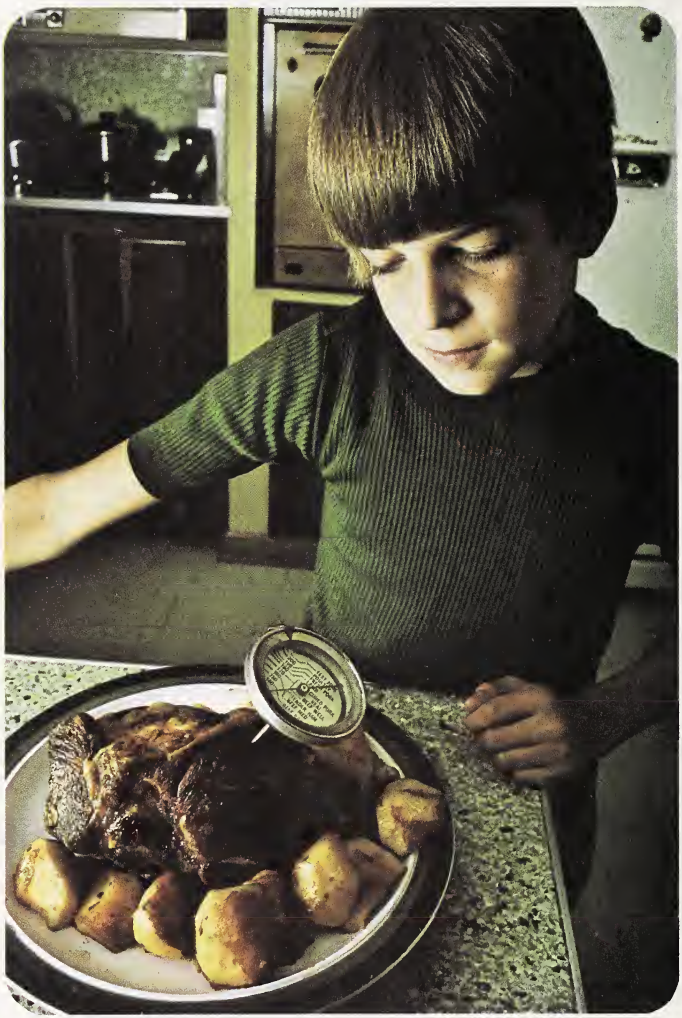
- Guess the temperature of different things around you. Then measure them.

*How close were your guesses?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, communicating, measuring, comparing, inferring, predicting.
*Sample findings:* The children will most likely observe that the thermometer in the warm water changed very little. The thermometer in the hot water dropped a few degrees because the water lost some of its heat. The thermometer in the ice water rose a few degrees because it was warmed by the air around it.

There are many other kinds of thermometers. Some are shown on this page and the next. Which kinds of thermometers have you seen?



## *A Second Look*

1. Why is feeling something with your hands not the best way to measure its temperature?
2. What does the temperature of something tell you?
3. What is the best way to measure temperature?



**Sample answers for "A Second Look":** 1. Feeling something with your hands is not the best way to measure its temperature because some people are more sensitive to hot and cold things than other people are. 2. The temperature of something tells you just how hot or cold it is. 3. The best way to measure temperature is to use a thermometer.

## Workers Who Use Science

Many times, heat from burning is helpful. You might cook or keep warm with this heat. Other times heat from burning is not wanted. Every year, many things are burned in fires.

Many people work to keep fires from starting or spreading. These people are called *fire department workers. Fire inspectors* are fire department workers who look in buildings to help make sure fires will not start. They make sure that things which might catch fire are not close to heaters. They also look for things which might start fires, such as worn electric wires.

*Fire fighters* are fire department workers who know how to put out fires after they start. These people sometimes have to go through rooms filled with smoke and heat. They know that hot air rises. By keeping down low, they may get to the fire and put it out.

To find out more about fire department workers, try to find answers to these questions:

What do fire fighters wear to protect themselves?[1]
What do fire department workers teach others about preventing fires?[2]
What is used to put out different kinds of fires?[3]

Along with sources of your own, visiting or writing to a local fire department may be helpful.



**Sample answers for "Workers Who Use Science":**

[1] Fire fighters wear helmets, rubber coats and boots, gloves, and sometimes face masks and oxygen tanks to protect themselves.

[2] To help prevent fires, fire department workers teach others always to watch a fire in a fireplace, always to keep hair and clothing away from fires, always to keep electric cords out from under rugs, and always to keep flammable liquids in airtight containers.

[3] Things used to put out different kinds of fires include water for wood, paper, and cloth fires and carbon dioxide for gasoline, grease, and electrical fires.

## Reviewing the Main Ideas

Heat comes from the sun, rubbing, electricity, the earth, and burning.
Heat moves in air.
Warm air rises, while cool air moves down.
Heat can move through objects.
Heat can move from one object to another.
There are many things you can use to keep heat from moving.
Heat can melt and boil some things.
Most objects take up more room when they are warm than when they are cool.
The temperature of something tells you just how hot or cold it is.
Temperature is measured in degrees.
The best way to measure temperature is to use a thermometer.

## Reading About Science


Adler, Irving and Adler, Ruth. *Heat and Its Uses.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1973.

Berger, Melvin. *Energy from the Sun.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1976.

Scott, John M. *Heat and Fire.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1973.

Simon, Seymour. *Hot & Cold.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1972.




**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 94.

**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of heat and temperature. Such articles might be found in reference books under the headings *solar energy, heat, temperature,* and *thermometer.*

# Testing for Understanding

**Ideas to Check**

On your paper, write *T* for each sentence below that is true. Write *F* for each sentence that is false.

F 1. All heat comes from the sun.
T 2. Warm air rises.
F 3. Heat cannot move through objects.
T 4. Heat can change water to steam.
T 5. Most things take up more room when they are warm than when they are cool.

**Words to Use**

Write on your paper the word that best fits in each blank below. Choose from these words: *boiling, geysers, rubbing, thermometer, heat, melting, volcanoes, electricity, measuring.*

1. You can make heat by ____ your hands together. — rubbing
2. When you plug in a toaster, you get heat from ____. — electricity
3. Heat comes from the ground through openings called ____ and ____. — geysers; volcanoes
4. Ice can change to water. This change is called ____. — melting
5. Water can change to steam. This change is called ____. — boiling
6. The best way to measure temperature is to use a ____. — thermometer



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Heat and Temperature" are provided for you on page T18 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional test questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**What Am I?**

1. I am water, but I am not wet.
2. I go up chimneys, but I do not come down chimneys.
3. I am a star you never see at night.

**Brainteasers**

1. There are many liquids used in thermometers. But no one wants to use water. Why?
2. People in hot places often wear light-coloured clothing. Why? People in cold places often wear dark-coloured clothing? Why?

**Fun with Words**

*thermo* + *meter* = *heat* + *measure* = *thermometer*

*Thermo* and *therm* mean "heat." What do you think the following things are?

thermos bottle  thermal underwear

Find other words that begin with *therm*.

**Things to Do**

1. When you stand in sunlight, you make a shadow. Heat cannot be seen. Does it make a shadow? Shine a flashlight on a wall. Hold a candle in front of the light. Does the candle make a shadow? Light the candle. Is there another shadow? If so, what is making this shadow?
2. Invent your own ice-cube keeper. See how long you can keep heat from melting ice. Use things that will keep heat out.



**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Heat and Temperature." You may also wish to encourage the children to make up other activities related to heat and temperature.

**Answers for "What Am I?":** 1. Steam. 2. Heat. 3. The sun.

**Answers for "Brainteasers":** 1. If water were used in thermometers, no one could measure a temperature above 100°C or below 0°C because the water would either boil or freeze. 2. People in hot places wear light-coloured clothing because it reflects heat and helps keep the people cool. People in cold places wear dark-coloured clothing because it absorbs heat.

**Sample answers for "Fun with Words":** A thermos bottle keeps things hot or cold. Thermal underwear keeps a person warm.

# 4 Sounds Around You



**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see pages T13–T14 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 100, 102, 103, 105, 110, 113, and 117.


How might some sounds make you feel?[1]

Why do you think it is important to hear sounds around you?[2]



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have them read the questions below the cartoon and discuss their answers to the questions.

**Sample answers for questions below the cartoon:**

[1] Some sounds might make me feel scared. Other sounds might make me feel happy or sad.

[2] I think it is important to hear sounds around me because hearing sounds helps me learn about things happening around me.

# 1 How are sounds alike?

Listen to the sounds around you. Do you hear someone talking? Or a car going by? Or maybe a dog barking? If not, what sounds do you hear?

## Making sounds

Most sounds you hear are different from one another in some ways. Some sounds are loud. Others are soft. In what other ways are sounds different from one another?[1] Do you think that sounds are alike in any ways? If so, how?[2]

[1] **Sample answer:** Pleasant, unpleasant, high, low.

[2] **Sample answers:** Yes. Because some sounds have the same pitch.



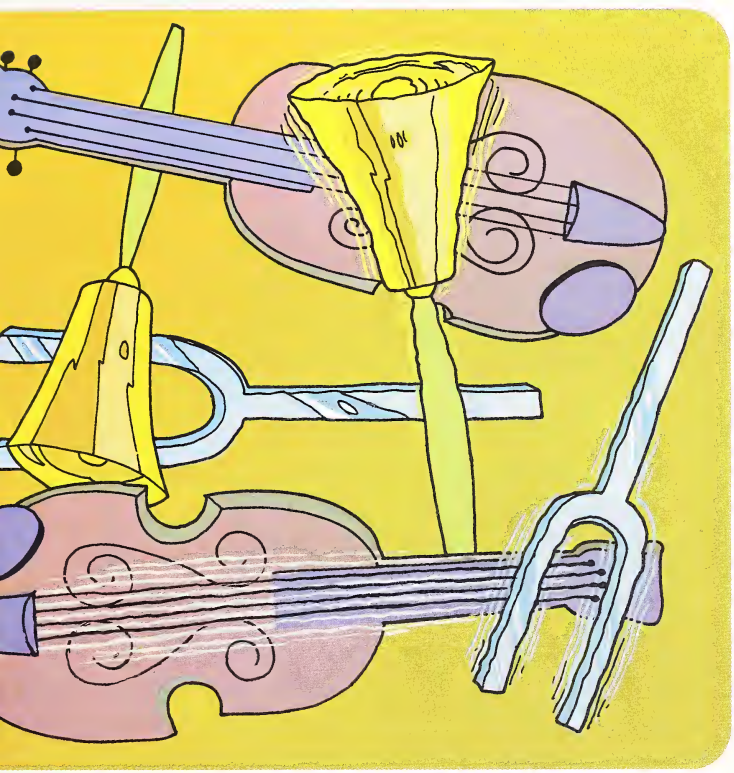
**Main concepts of the chapter (pages 98–105):**
For a sound to be made, an object or part of it must be vibrating.
People use vocal cords to make voice sounds.
Sounds can travel in all directions and through many things.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—show by example how sounds are made;
—describe how people make voice sounds;
—demonstrate that sounds can travel in all directions and through many things.
**Important words:** vibrating, voice box, vocal cords.

***Sounds made by objects.*** Many objects, or things, around you make sounds. But for an object to make a sound, one important thing must be happening to it. The object or part of it must be *vibrating* [VY-BRAYT-ihng], or moving back and forth very fast. What objects have you seen or felt vibrating fast enough to make a sound?[1]

Look at the picture on this page. Which objects do you think are making a sound? Why?[2]

### For You to Think About

Many sounds you hear are important to you. Make a list of the sounds you heard today. In what ways are these sounds important to you? What are some other sounds that might be important to you? Why might they be important?



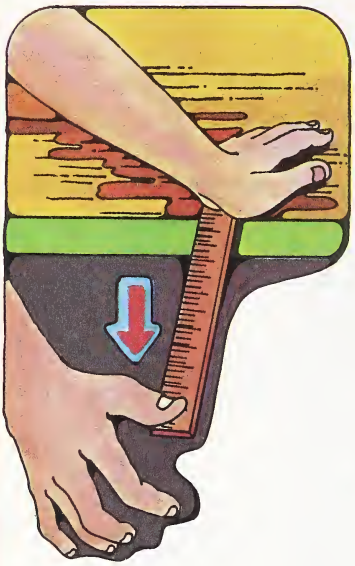
[1] **Sample answer:** Piano strings, jackhammer, telephone, alarm clock.

[2] **Sample answers:** Violin at bottom, tuning fork at right, bell in centre. They look as if they are vibrating.



**Sample answers for "For You to Think About":** Siren, car horn, fire alarm. They are important because they warn me of possible danger.

## FINDING OUT



**Can you see how a sound is made?**

*You will need: wooden ruler or piece of wood about the size of a ruler*

- Hold one end of the ruler firmly on a table as shown.
- Push down on the other end of the ruler with your thumb.
- Quickly slide your thumb off the end of the ruler.

*What do you hear?*

- Try it again. Watch the ruler very carefully.

*What is happening to the ruler while it is making a sound?*

***Sounds made by your voice.*** Place three fingers on your throat. Place them on top of the "bump" in your throat. Hum something. What did you feel? Do you think you have found where your voice sounds are made? Why or why not? [1]

The bump you felt is your *voice box.* Inside your voice box are two important things. They are called *vocal cords* [VOH-kuhl KAWRDZ]. The

[1] **Sample answers:** My voice. Yes, because I felt a vibration.



**Teaching helps for "Finding Out":**
*Processes used:* observing, communicating.
*Sample findings:* The children may observe that when they make a ruler vibrate, it makes a sound.
*Extending the "Finding Out":* You may wish to provide the children with another observable example of how sounds are made. For them to do this, the children will need a glass of water and a tuning fork. Have the children strike the tuning fork on the palm of their hand. Have them look at the tuning fork while they listen to the sound it makes. Then ask them this question: What was the tuning fork doing while it was making a sound? (Sample answer: It was vibrating.) Then have the children strike the tuning fork again and dip it into the glass of water. Then ask them this question: What do you think caused the water to splash about in the glass? (Sample answer: The movement of the tuning fork.)

picture on this page shows what the vocal cords look like. Why do you think your vocal cords are important?[1]

When you talk, you breathe out. And as you breathe out, air passes between your vocal cords. What do you think air does to your vocal cords to make sounds?[2]

As you may know, humming and talking are some voice sounds you make. What are some other voice sounds you make? Do you think you use your vocal cords to make these sounds? How might you find out?[3]

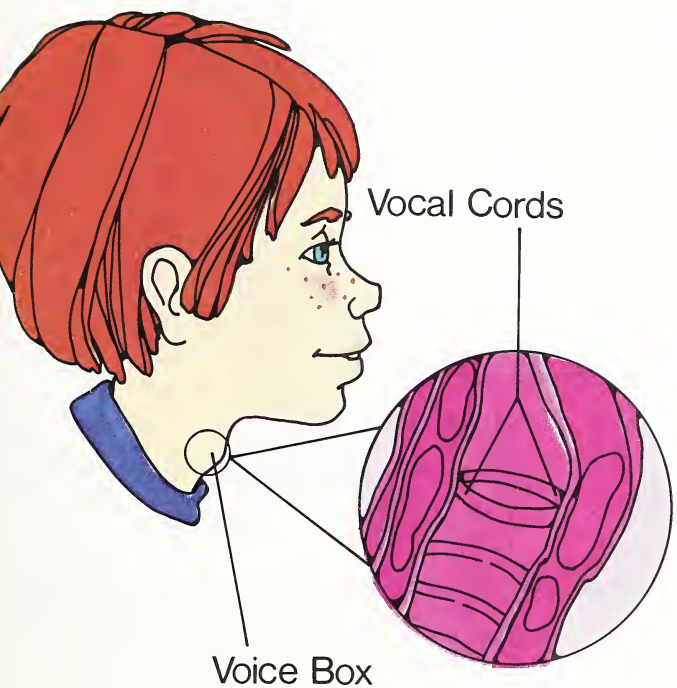
### For You to Think About

As you may know, when you make voice sounds, you breathe out. But why do you think you do not make voice sounds every time you breathe out?

[1] **Sample answer:** Because I use them to make voice sounds.

[2] **Sample answer:** It makes them vibrate.

[3] **Sample answers:** Crying, laughing, singing. Yes. By touching the bump in my throat while doing these things.






**Suggested discussion:** When discussing "Sounds made by your voice," you might point out to the children that people sometimes get an infection in their vocal cords. This sometimes keeps these people from making voice sounds for a day or two. You might then ask the children this question: What might such an infection keep the vocal cords from doing? (Sample answer: It might keep the vocal cords from vibrating as easily as they usually do.)

**Sample answer for "For You to Think About":** I don't make voice sounds every time I breathe out because I have to tighten my vocal cords before the air will make them vibrate.

**Suggested activity:** After discussing "For You to Think About," you may wish to have the children find out if it is possible to make voice sounds while they breathe in. Have them try this a few times as it usually takes a little practice before voice sounds can be made in this way.

## FINDING OUT

**How do your vocal cords make sounds?**

*You will need: toy balloon*

Because your vocal cords are inside your body, you cannot see them make sounds. But you can use a balloon to help show how vocal cords work.

- Fill the balloon with air. Hold it as shown.
- Stretch the mouth of the balloon by pulling on each side. At the same time, let some air out.
- Watch the sides of the balloon at the opening.

*What do you see?*
*What do you hear?*
*What do you think is making the sound?*
*Why?*
*How do you think your vocal cords and the sides of the balloon are alike?*

### Travels of sounds

You most likely know that sounds are alike in how they are made. But sounds are also alike in how they travel.

***Up, down, all around?*** Suppose some friends were standing in a circle around you. If you



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring.
*Sample findings:* The children will most likely observe that as the mouth of the balloon vibrates, it makes a sound. The children may infer from this that as their vocal cords vibrate, they make voice sounds.

were to clap your hands above your head, your friends would most likely hear the clapping sound. This is because the sound would travel in the direction of each person in the circle. In what other directions do you think the sound would travel? [1]

[1] **Sample answer:** Up and down.

## FINDING OUT

**In what directions can sound travel?**

*You will need: 2 metal spoons, piece of string*

- Tie one end of the string to a spoon.
- Have a partner hit this spoon with the other spoon as you walk in a circle around your partner.

*Could you hear the sound of the spoon from any place in the circle?*

- Have your partner sit on the floor. Stand so that your head is above the spoon.
- Have your partner hit the spoons together.

*Did you hear the sound of the spoon?*

- Sit on the floor. Have your partner hit the spoons together above your head.

*Did you hear the sound of the spoon?*
*In what directions can sound travel?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, hypothesizing.
*Sample findings:* The children will most likely observe that they can hear the sound of the spoon at all times. From this, the children may infer that sounds can travel in all directions.

## Exploring on Your Own

As you may know, sounds can travel through many things. See if you can find out how sounds travel through things. To do this, you might use reference books. Look under the heading *sound* or *sound waves.*

***Through air, water, and other things?*** Most sounds you hear reach you by traveling through air. But sounds can also travel through other things.

Look at the pictures on this page. Through what things is sound traveling?[1] What do you think are some other things sounds travel through?[2]

[1] **Sample answer:** Water and wood.
[2] **Sample answer:** Metal and rock.



**Sample finding for "Exploring on Your Own":** Sounds travel through things in waves.

**Suggested activity:** When discussing "Through air, water, and other things?" you may wish to have the children "see" how sounds travel through things. For them to do this, the children will need a large, shallow pan of water and some small objects such as pennies or stones. Have the children fill the pan with water and let it set until the water is still. Then have them drop a small object into the centre of the pan and watch the waves that form. You might then tell the children that sounds travel in much the same way as these waves of water traveled. Then you might want to explain to the children that if the waves they saw in the pan were sound waves, the children would not hear the sound once these waves touched the pan. Then ask them why this would be so. (Sample answer: Sounds travel in all directions unless something blocks them.)

# FINDING OUT

**How can you make a string telephone?**

*You will need: 2 paper cups, about 4 m of string, sharp pencil*

- Make a small hole in the centre of the bottom of each cup with the pencil.
- Put one end of the string through the bottom of one of the cups as shown.
- Tie a knot in the end of the string.
- Do the same thing with the other paper cup.
- Get a partner and hold the cups as the children are doing in the picture. Be sure to keep the string straight.
- Whisper something to your partner through your "telephone." Have your partner whisper to you. If you did not hear each other, try whispering a little louder.

*Did your telephone work? If so, how did your voice reach your partner's ear?*

## *A Second Look*

1. In what ways are sounds alike?
2. How are sounds made?
3. In what ways do sounds travel?



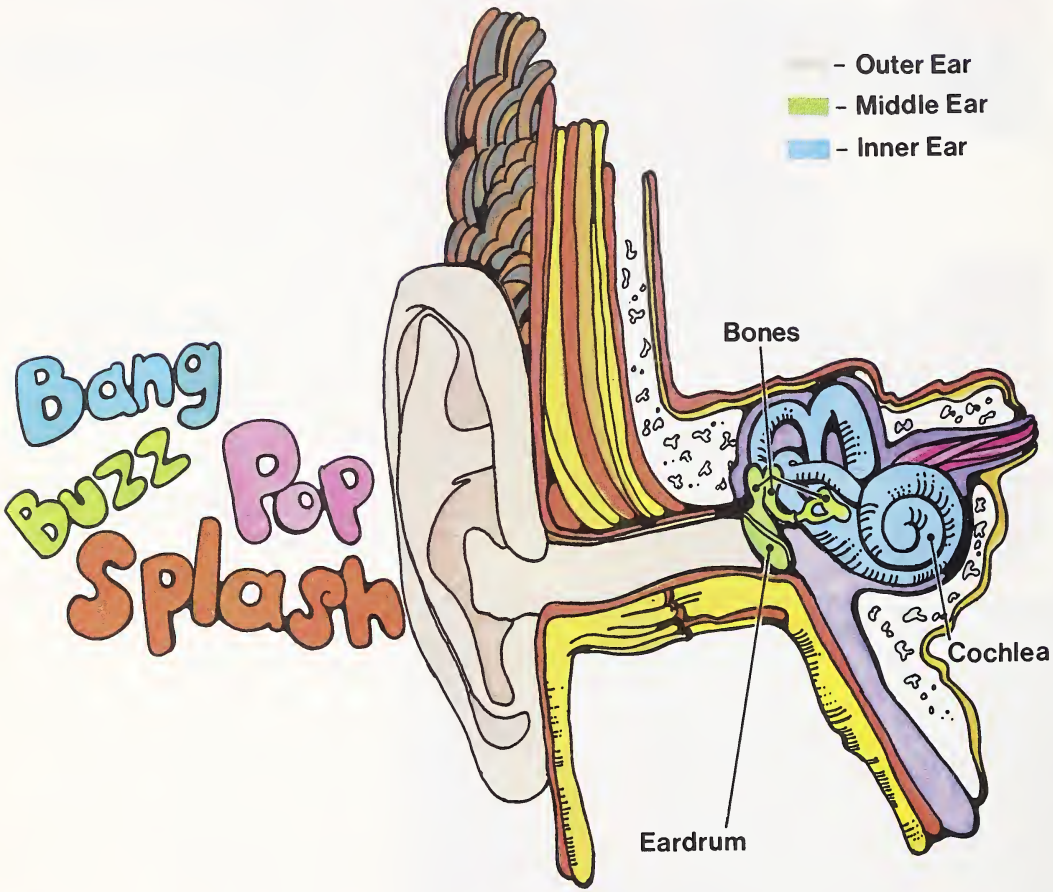
**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring.
*Sample findings:* The children will probably observe that their "telephone" works. They will most likely infer that their voice reached their partner's ear by traveling through the string.

**Sample answers for "A Second Look":** 1. Sounds are alike in how they are made and in how they travel. 2. Sounds are made when an object or part of it is vibrating. 3. Sounds travel up, down, all around, and through many things.

## 2 Hearing sounds

*Bang! Pop! Buzz! Splash!* As you may know, these sounds and others can travel through many things to reach your ears. Look at the drawing below. What do you think happens to these sounds so that you can hear them?[1]

[1] **Sample answer:** The sounds travel through my ear.






**Main concepts of the chapter (pages 106–110):**
Most sounds people hear travel through the three main parts of the ear.
Before people can hear sounds, the sounds must be changed into messages about sounds and must travel through a nerve to the brain.
Hearing sounds with both ears helps people understand sounds and tell where they come from.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—describe how they hear sounds;
—demonstrate how hearing sounds with both ears is helpful.
**Important words:** outer ear, middle ear, eardrum, inner ear, cochlea, nerve, brain.

## How do you hear sounds?

Try "wiggling" your ears. Can you do it? Some people can. Some people cannot.

***Outer ear.*** The part of the ear some people can wiggle is one part of the *outer ear*. The outer ear has another part. This part is a small tunnel. Look at someone's ears. You can see the opening to this tunnel.

One thing the outer ear does is "catch" sounds. It also carries these sounds into another part of the ear. How do you think the shape of the outer ear helps do these things?[1]

***Middle ear.*** The end of the tunnel in the outer ear is covered by a thin piece of skin. This piece of skin is called the *eardrum*. The eardrum is a part of the *middle ear*.

The middle ear is also made up of three small bones. As sounds hit the eardrum they make the eardrum vibrate. This makes the small bones vibrate. What do you think would happen if these bones did not vibrate?[2]

You most likely have heard someone say that you should not put anything into your ears. Why do you think you should not do this?[3]

***Inner ear.*** Sounds are carried by the bones in the middle ear to a small opening. The sounds then go through this opening and into the *inner ear*.

[1] **Sample answer:** It can do these things because it is shaped like a funnel.

[2] **Sample answer:** A person would not be able to hear.

[3] **Sample answer:** It might hurt my ear, especially my eardrum.

### Exploring on Your Own

Most sounds you hear reach your inner ear through your outer ear and middle ear. But some sounds can reach your inner ear in other ways. See if you can find out how. To do this, you might use reference books. Look under the heading *ear*, *hearing*, or *hearing aid*.

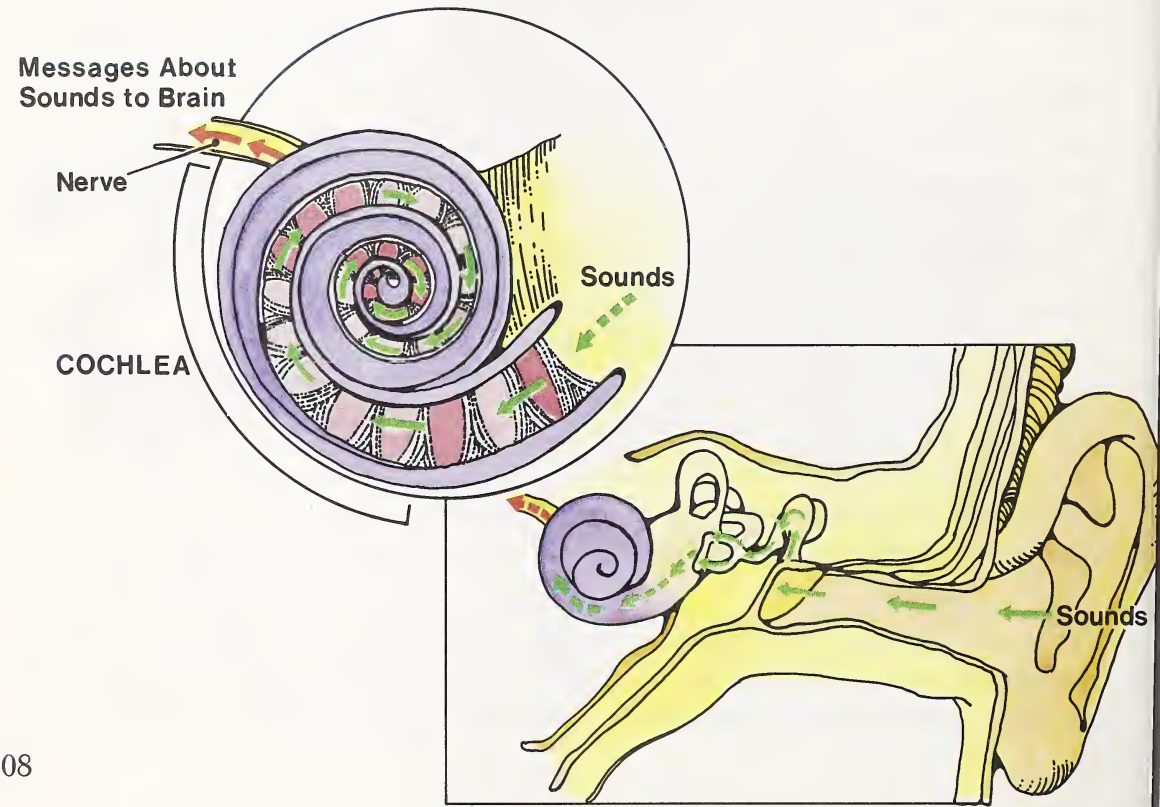


**Suggested discussion:** You may wish to use the picture on page 106 as an aid in teaching the children about how a sound travels through the ear. First have the children read the material about the parts of the ear on page 107. Then have the children use the picture on page 106 to trace sounds as they travel through the ear.
**Sample finding for "Exploring on Your Own":** Some sounds reach the inner ear by traveling through the bones of the skull.

The inner ear is made up of many parts. The part that sounds move through is called the *cochlea* [KOH-klee-uh]. Look at the picture on this page. You will see how sounds move through the cochlea.

Connected to the cochlea is a large *nerve* [NURV]. This nerve picks up messages about sounds. It then carries these messages to the *brain.* Why do you think these messages must go to the brain?[1]

[1] **Sample answer:** They must go to the brain or a person would not hear and understand the sound.






**Teaching helps for the picture above:** At this point, some of the children may want to know why it is necessary for sounds to be changed into messages about sounds (nerve impulses). To answer this question, you might suggest to the children that the brain has a certain "language" it understands, just as they have a certain language they understand. It is because the brain only understands its language that sounds must be changed into messages about sounds.

## Are two ears helpful?

Listen closely to the sounds around you. Now cover one ear with your hand. Listen again. Which way did you hear best?[1]

As you may know, you need only one ear to hear some sounds. But when you listen with one ear, these sounds might be hard to understand. Why?[2]

What if you thought you were not hearing as well as you should. What might you do? Why?[3]

Hearing with both ears helps you understand sounds. But hearing with both ears also helps you tell where sounds are coming from. Why do you think this is so?[4]

Why might it be important to be able to tell where sounds are coming from?[5]

[1] **Sample answer:** When I listened with both ears.

[2] **Sample answer:** The sounds may seem run together and softened because they are coming from a direction opposite my ear.

[3] **Sample answers:** I would tell my parents, a teacher, or the school nurse. So that I could have my ears checked by a doctor.

[4] **Sample answer:** Because when I listen to a sound with both ears, the sound usually reaches one ear first.

[5] **Sample answer:** Knowing where sounds come from can sometimes help me keep from getting hurt.

*When a doctor gives a checkup, one thing the doctor does is look into your ears. Why do you think a doctor does this?*



**Sample answer for the caption:** To make sure there is nothing wrong with the tunnel and the eardrum.

# FINDING OUT

**How can you tell where sounds are coming from?**

*You will need: 16 hard objects such as pencils, quiet room*

- Give 8 people 2 objects each. Have them sit in a large circle.
- Sit in the middle of the circle. Cover your eyes with a blindfold and cover one ear with your hand.
- Have one person hit the objects together 2 or 3 times. Point to where you think the sound came from. Keep doing this until all the people have hit the objects together.

*How many times did you guess right?*

- Try it again. This time listen with both ears.

*How many times did you guess right?*
*Which way did you find it easier to tell where the sounds were coming from?*

## *A Second Look*

1. What things does the outer ear do to help you hear sounds?
2. In what ways does hearing sounds with both ears help you?



**Teaching helps for "Finding Out":**
*Processes used:* observing, collecting data, comparing.
*Sample findings:* The children will most likely discover that it is easier to tell where sounds are coming from when they listen with both ears.
**Sample answers for "A Second Look":** 1. One thing the outer ear does to help me hear sounds is to catch sounds. Another thing the outer ear does is to carry sounds into another part of my ear. 2. One way hearing sounds with both ears helps me is by helping me understand sounds. Another way is by helping me tell where sounds come from.

# 3 High and low sounds

Think about the many things around you that make sounds. Some things make high sounds. Some make low sounds. Why do you think this is so?[1]

[1] **Sample answer:** Because some things vibrate faster than others.

*The girl is blowing across the tops of the bottles. Why do you think she is doing this?*

## What causes high and low sounds?

You most likely know that all sounds are made by things vibrating. But some things vibrate faster than others. The faster something vibrates, the higher the sound it makes. The slower something vibrates, the lower the sound it makes. What do you think makes some things vibrate faster than others?[2]

[2] **Sample answer:** Their size and their tightness.



**Main concepts of the chapter (pages 111–118):**
The faster something vibrates, the higher the sound it makes.
Smaller things vibrate faster than larger things.
The tighter something is, the faster it vibrates.
Music is made by things vibrating.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state why some sounds are higher than others;
—state why smaller, vibrating things make higher sounds than larger, vibrating things;
—state why the tighter something is, the higher the sound it makes;
—identify three different kinds of musical instruments and explain what is vibrating on or in each one to make sounds.

**Important words:** vibrating, tightness, size, string instruments, wind instruments, percussion instruments.

***Tightness of objects.*** As you may know, some things vibrate faster than others. One thing that can make this happen is their tightness.

Suppose you had a toy balloon filled with air. And suppose you were to stretch the mouth of the balloon by pulling on each side. If you let some air out of the balloon, it would make a sound. It would do this because the mouth of the balloon would be vibrating.

But what if you were to stretch the mouth of the balloon even more and let some air out of it. The mouth of the balloon would vibrate faster than before. Which time do you think the balloon would make the higher sound? Why? [1]

### For You to Think About

Inside your voice box are some muscles. These muscles help your vocal cords make high and low sounds. What do you think these muscles do to help make high and low sounds?

[1] **Sample answers:** When the mouth was stretched more. Because it would be tighter then.

*What might you do to this drum so that it makes a higher sound? A lower sound?*



**Sample answer for "For You to Think About":** The muscles tighten the vocal cords to make high sounds. The muscles relax and loosen the vocal cords to make low sounds.

**Sample answer for the caption:** I could tighten the knobs or step on the pedal to make a higher sound because doing these things tightens the drumhead. I could make a lower sound by loosening the knobs, which loosens the drumhead.

**Suggested discussion:** When discussing "Tightness of objects," you may wish to have the children discover some other things that make higher or lower sounds, depending on their tightness. You might do this by asking the children the following questions: What are some musical instruments you know of that have strings? (Sample answer: Banjo, guitar, violin.) How might tightening and loosening the strings change the sound they make? (Sample answer: Tightening makes sounds higher. Loosening makes them lower.)

## FINDING OUT

**Will tightening a rubber band change the sound it makes?**

*You will need: rubber band*

- Hold one end of the rubber band between your teeth. Hold the other end with your thumb and first finger.
- Tighten the rubber band a little by pulling with your thumb and finger.
- Pluck the rubber band with a finger. Watch the rubber band and listen to the sound it makes.
- Tighten the rubber band a little more.
- Pluck the rubber band again. Watch the rubber band and listen to the sound it makes.

*Did tightening the rubber band make the sound higher? If so, why?*

*Size of objects.* There is something else that can make some things vibrate faster than others. This is their size.

What if you were to hit a big pan and then a little pan. The little pan would vibrate faster than the big pan. Which pan do you think would make the higher sound? Why?[1]

[1] **Sample answers:** The little pan. Because the faster something vibrates, the higher the sound it makes.



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* The children should observe that when they tighten the rubber band, the sound becomes higher. The children may also observe or conclude that when the rubber band makes a higher sound, it is vibrating faster.

## Making music

Do you like to sing? Or play a musical instrument? Or maybe just listen to music? Music, like other sounds, is made by things vibrating.

Look at the picture on this page. How do you think music is made with each of these instruments?[1]

[1] **Sample answer:** By hitting the drums and the xylophone, by blowing into the cornet while tightening and loosening the lips and pushing the valves up and down, by pressing on the guitar strings with one hand and plucking the strings with the other hand, and by shaking the maracas.



**Suggested discussion:** When discussing "Making music," you may wish to name some other instruments, such as a trombone, a clarinet, and a piano, and ask the children these questions: How do you think music is made with a trombone? (Sample answer: By blowing into it while tightening and loosening the lips and while moving the slide.) A clarinet? (Sample answer: By blowing into it and covering holes in the clarinet with the fingers.) A piano? (Sample answer: By pressing the keys with the fingers.)

***String instruments.*** As you may know, some musical instruments have strings. When you pluck the strings, sounds are made.

Look at the picture of the guitar on this page. Which strings do you think would make high sounds? Why?[1] Which strings do you think would make low sounds? Why?[2] What might you do to change the sound of each string?[3]

***Wind instruments.*** Have you ever blown into a toy whistle? Or across the top of a soda bottle? If so, you most likely know that you can make sounds this way. That is, air can be made to vibrate.

**For You to Think About**

Some string instruments are played most of the time by using a bow. A violin is one such instrument. What do you think the bow does to the strings of a violin?

[1] **Sample answers:** The strings on the bottom. Because they are smaller.

[2] **Sample answers:** The strings on the top. Because they are larger.

[3] **Sample answer:** I could tighten the strings with the knobs or press the strings against the neck with my fingers to make higher sounds. I could loosen the strings to make lower sounds.



**Suggested activity:** After discussing "String instruments," you may wish to have the children learn more about such instruments by having the children look at the strings inside a piano. You might then ask them these questions: Which string do you think would make the highest sound? Why? (Sample answers: The smallest one. Because it vibrates the fastest.) Which string will make the lowest sound? Why? (Sample answers: The largest one. Because it vibrates the slowest.) How might you find out if your answers are correct? (Sample answer: By pressing each key on a piano until I find the key that makes the smallest string vibrate and the key that makes the largest string vibrate.)

**Sample answer for "For You to Think About":** The bow makes the strings vibrate.

Air is used to make sounds in many musical instruments. Which of these instruments do you know of?[1]

[1] **Sample answer:** Trombone, flute, clarinet, trumpet, tuba.

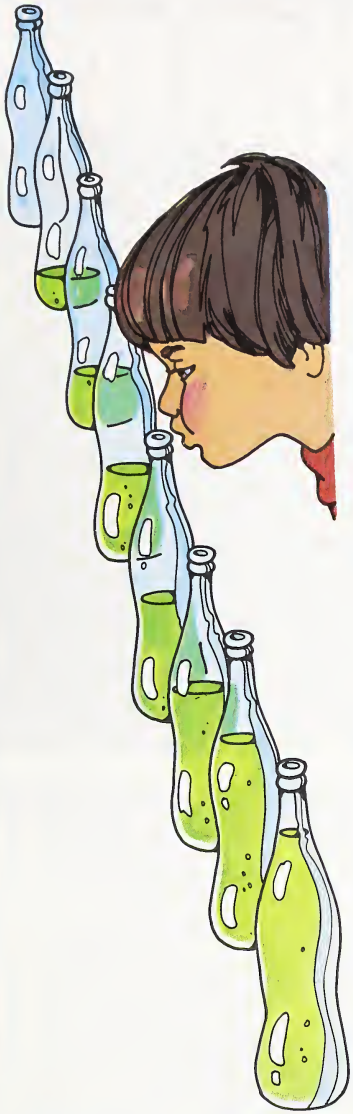
*Which instruments shown do you think are wind instruments? How might you make sounds higher or lower with each of these wind instruments?*

Suppose you had two empty soda bottles. One is big. The other is little. If you were to blow across the top of each bottle, the little bottle would make the higher sound. This is because the little bottle would have less air inside it than the big bottle. In which bottle do you think the air would be vibrating faster? How would you know?[2]

[2] **Sample answers:** The little bottle. Because it makes the higher sound.



**Sample answers for the caption:** French horn and trumpet. By tightening and loosening the lips while blowing into it and while pushing the valves up and down.



# FINDING OUT

**How can you make music with soda bottles?**

*You will need: 8 empty soda bottles (all the same size), funnel*

- Place the soda bottles in a line on a table.
- Blow across the top of each bottle.

*What do you think is vibrating in the bottles to make sound? Why do you think all the bottles make about the same sound?*

- Pour some water into one bottle.
- Blow across the top of this bottle and an empty bottle.

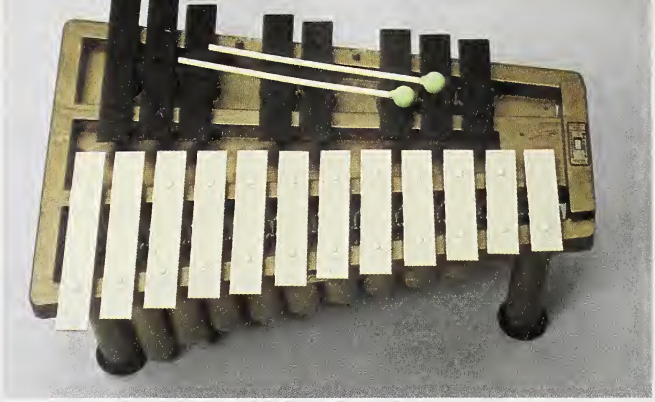
*Which bottle made the higher sound? Why?*

- Leave one bottle empty. Pour a different amount of water into all the other bottles. Place them in a line. Start with the bottle that makes the lowest sound.
- Try to play a song by blowing across the tops of the bottles.

*If you wanted to make some of the sounds higher, what might you do?*
*If you wanted to make some of the sounds lower, what might you do?*



**Teaching helps for "Finding Out":**
*Processes used:* comparing, inferring, predicting.
*Sample findings:* The children will most likely infer that it is the air in the bottles that is vibrating. They may also infer that since the bottles are about the same size and are empty, the amount of air vibrating in each is about the same. This would make the sound from each bottle about the same. After the children have poured some water into one bottle and have blown across the top of this bottle and of an empty bottle, they will find that the bottle with water in it will make a higher sound. From this they may infer that as the amount of vibrating air becomes smaller, the sound the air makes becomes higher. After the children have discovered that a smaller amount of air vibrates faster than a larger amount of air, they may predict that they can make higher sounds by adding more water and lower sounds by reducing the amount of water.



***Percussion instruments.*** Some musical instruments make sounds when they are hit. These instruments are known as the *percussion* [pur-KUHSH-uhn] instruments.

Look at the instruments shown on this page. They make sounds when you hit the pieces of metal. If you wanted to make a high sound, which piece of metal might you hit? Why?[1] Which ones might you hit to make a lower sound? Why?[2]

What are some other percussion instruments you know of?[3]

[1] **Sample answers:** I would hit the smallest piece of metal. Because it would vibrate the fastest.

[2] **Sample answers:** I could hit any of the pieces of metal except for the smallest to make a lower sound. Because the larger pieces vibrate slower.

[3] **Sample answer:** Drum, cymbals.

## *A Second Look*

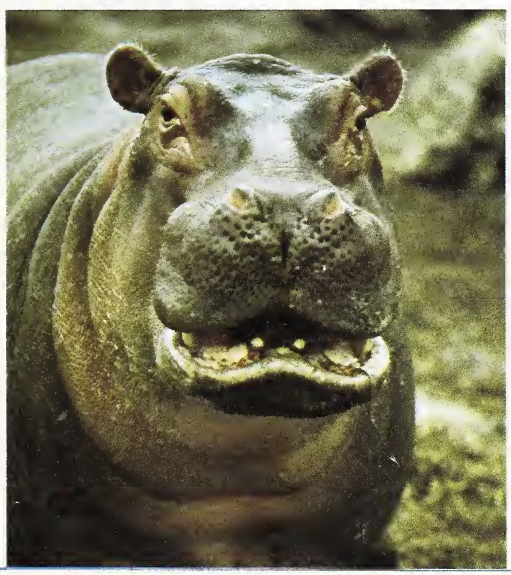
1. How might making something vibrate faster change the sound it makes?
2. What might make some things vibrate faster than other things?



**Sample answers for "A Second Look":** 1. Making something vibrate faster will make the sound it makes higher. 2. The size and the tightness of some things make them vibrate faster than others.

# 4 Animal sounds

Have you ever heard a bird sing? Or a bee buzz? Or maybe a cat meow? These sounds are only a few of the many animal sounds you may have heard. What are some other animal sounds you know of?





**Main concepts of the chapter (pages 119–123):**
Some animals make sounds by using vocal cords.
Some animals make sounds with other parts of their body.
Some animals have ears that are somewhat like people's ears.
Some animals have ears that are very different from people's ears.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state two ways in which animals make sounds;
—state how some animal ears are like people's ears;
—state how some animal ears are different from people's ears.

**Important words:** vocal cords, vibrating, eardrum.

## How do some animals make sounds?

As you may know, there are many animals that make sounds. But all animals do not make sounds in the same way. In what ways do you think animals make sounds?[1]

[1] **Sample answer:** By using vocal cords and other parts of their body.

*Vocal cords.* Some animals make voice sounds in the same way you do. These animals use vocal cords to make sounds. Horses, cats, and birds are such animals. What other animals do you think use vocal cords to make sounds?[2]

*Other parts of the body.* Some animals do not have vocal cords. Yet these animals make sounds.

You most likely have had a fly buzz around you. The buzzing sound you heard is made by the fly's wings vibrating. What are some other animals you know of that make sounds with their wings?[3]

As you may know, a cricket makes a chirping sound. This sound is made when the cricket rubs its wing covers together. Look at the picture on this page. You can see the parts of the body a cricket uses to make sounds.

A rattlesnake uses a different part of its body to make sounds. Look at the picture of the rattlesnake on this page. How do you think a rattlesnake makes sounds?[4]



[2] **Sample answer:** Dogs, cows, pigs, sheep.
[3] **Sample answer:** Bees, wasps.
[4] **Sample answer:** By shaking the end of its tail.
**Suggested research and activity:** After discussing "How do some animals make sounds?" you may wish to have the children find out about some other animals that use either vocal cords or other parts of their body to make sounds. The children might look in reference books under the heading *animals* to do this. After the children have done this, you might have them collect pictures or draw pictures of these animals and the animals shown on this page. Then you might have the children use their pictures to make a bulletin-board display showing animals that make sounds by using other parts of their body.

## Some interesting ears

Many animals have ears. Some animals have ears that are somewhat like yours.

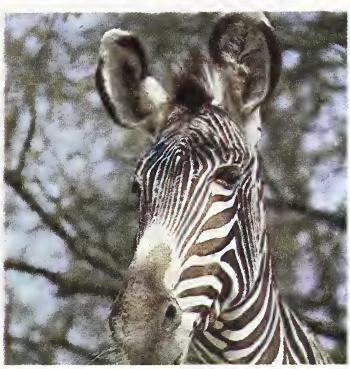
Look at the pictures on this page. In what ways are these animals' ears like yours? [1] In what ways are their ears different from yours? [2]

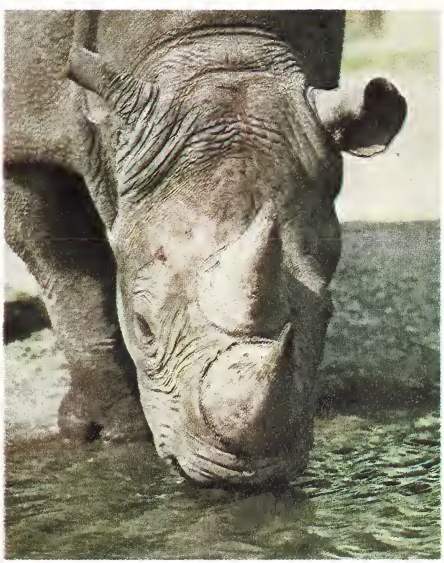
Have you ever watched a dog's ears? If so, you most likely have seen that the ears sometimes lay flat. Other times the ears are straight up. What other animals do you know of that can move their ears? [3]

[1] **Sample answer:** They are on the outside of the body and shaped to catch sounds.

[2] **Sample answer:** They are much bigger and they are nearer the top of the animal's head.

[3] **Sample answer:** Deer, horses, cows.







**Suggested activity:** After discussing "Some interesting ears," you may wish to have the children cut out pictures of animals from magazines or draw pictures of animals that have interesting ears. You might then have the children make a bulletin-board display with their pictures. Have the children discuss how their ears are alike and different from the ears of these animals.

[1] **Sample answer:** Because they can move their ears in the direction the sound is coming from without moving their head or body.

### For You to Think About

A fish can hear many sounds. Yet it has only inner ears. How do you think sounds reach the inner ears of a fish?

Animals that move their ears can most often hear better than you can. How might being able to move their ears help animals hear better than you can?[1]

Some animals have ears that are much different from yours. A katydid does not have outer ears. And its eardrums are on the outside of the body!

Look closely at the katydid's front leg in the picture below. You will see a small spot just below the "knee." This is one of the katydid's eardrums.

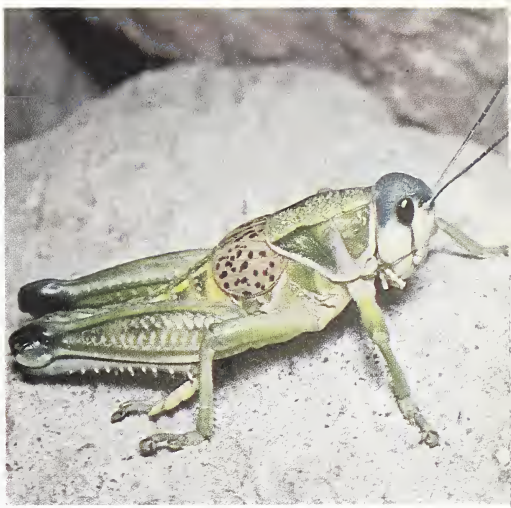


**Sample answer for "For You to Think About":** By traveling through the bones of the fish's body.
**Teaching help for the picture above:** One of the katydid's eardrums is pointed out by the blue arrow. The other eardrum is located in the same place on the other leg.

Grasshoppers and frogs also have eardrums on the outside of their body. They look like the eardrums of the katydid. Look at the pictures of the grasshopper and frog on this page. Find their eardrums.

Why do you think it is important for animals to hear sounds?[1]

[1] **Sample answer:** To protect themselves and know what is happening around them.



## *A Second Look*

1. In what ways do animals make sounds?
2. What helps some animals hear sounds better than you can?
3. What are some animals that do not have outer ears?



**Sample answers for "A Second Look":** 1. Animals make sounds by using vocal cords and by using other parts of their body. 2. Some animals hear sounds better than I can because they can move their ears. 3. Some animals that do not have outer ears are katydids, grasshoppers, and frogs.

**Teaching help for the pictures above:** The eardrum of the frog and the grasshopper are each pointed out by a blue arrow. Both animals have another eardrum. Each eardrum is on the opposite side of their body.

## Workers Who Use Science

As you may know, you use your vocal cords to make sounds. You also use your lips, teeth, and tongue to change these sounds into words.

There are some people who have trouble making voice sounds. There are also some people who have trouble changing their voice sounds into words. These people have a speech problem.

There are many workers who help people with a speech problem. One such worker is called a *speech therapist* [THER-uh-puhst].

One thing a speech therapist does is try to find the cause of a speech problem. Another thing a speech therapist does is help some people learn how to make voice sounds better. A speech therapist also helps some people practise changing voice sounds into words.

To find out more about a speech therapist, try to find answers to these questions:

What else might a speech therapist do to help people with a speech problem? [1]
What are some other causes of speech problems? [2]
How can people without vocal cords be helped to speak? [3]

Along with sources of your own, you may find that writing to the following source may help you: Canadian Speech and Hearing Association, Izaak Walton Killam Hospital, 5919 South Street, Halifax, Nova Scotia.

*This boy is learning to make better voice sounds. How might feeling the vibrations of his vocal cords help him do this?*

**Sample answer for the caption:** When the boy makes a correct voice sound, the speech therapist tells him so and has him feel the vibration of his vocal cords that produced the correct sound. Then the boy can practise saying the sound and check to see if it is the correct sound by feeling the vibration he produces.

**Sample answers for "Workers Who Use Science":**

[1] A speech therapist might recommend that a person have a physical examination to determine if there is a physical reason for that person's speech problem.

[2] Some other causes of speech problems are a loss or reduction in hearing, emotional problems, and dental problems.

[3] People without vocal cords can be helped to speak by learning to swallow air and then forcing this air out their throat in a way that makes a sound.

## Reviewing the Main Ideas

For something to make a sound, it or part of it must be vibrating.
You use your vocal cords to make voice sounds.
Sounds can travel in all directions.
Your ear is made up of three parts—the outer ear, middle ear, and inner ear.
Hearing sounds with both ears helps you understand sounds and tell where they come from.
The faster something vibrates, the higher the sound it makes.
Smaller things vibrate faster than larger things.
The tighter something is, the faster it vibrates.
Music, like other sounds, is made by things vibrating.
Some animals make sounds by using vocal cords.
Some animals make sounds with other parts of their body.

## Reading About Science

Aikman, J.A. *Sound*. Toronto, Ontario: Macmillan Company of Canada Ltd., 1975.
Knight, David. *Let's Find Out about Sound*. Toronto, Ontario: Grolier Limited, 1975.
McInnes, John and Murray, William. *On the Air*. Don Mills, Ontario: Thomas Nelson & Sons (Canada) Ltd., 1975.



**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 126.
**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of sound. Such articles might be found in reference books under the headings *sound, sound waves, noise, noise pollution,* and *ear*.

# Testing for Understanding

**Ideas to Check**

On your paper write *T* for each sentence below that is true. Write *F* for each one that is false.

T 1. Sounds can travel through many things.
F 2. Sounds travel in only two directions.
F 3. The faster something vibrates, the lower the sound it makes.
T 4. Air is used in some musical instruments to make sounds.
F 5. Animals that do not have vocal cords cannot make sounds.
T 6. Animals that can move their outer ears can most often hear better than you can.

Write on your paper the word or words that best fit in each blank below. Choose from these words: *outer ear, nerve, brain, vocal cords, eardrum, vibrating, inner ear.*

1. The parts of your voice box which you use to make sounds are your ____.
2. The part of your ear that "catches" sounds is called your ____.
3. The thin piece of skin that covers one end of the small tunnel in the ear is called the ____.
4. Messages about sounds are picked up by a large ____ and sent to the brain.
5. For something to make a sound, it or part of it must be ____.

**Words to Use**

vocal cords
outer ear
eardrum
nerve
vibrating



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Sounds Around You" are provided for you on page T19 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional test questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**What Am I?**

1. I am a sound that is made only once. Yet I can be heard many times.
2. I am a drum, but you cannot beat on me.
3. I am a cord, but you cannot tie me in a knot.

**Fun with Words**

Some words sound like what they mean. Two such words are *buzz* and *hum.* Make a list of some other words you know of that sound like what they mean.

**Things to Do**

1. Make a rubber-band guitar. Get eight different-sized (thickness or length) rubber bands and a shoe-box lid. Put the rubber bands around the lid. Try playing some songs.

2. Make some sound effects. You might pour some rice or birdseed over Ping-Pong balls to make the sound of a hard rain. You might make the sound of an egg frying in a pan by slowly crumpling a small piece of cellophane. Try making some other sounds. See if people can tell what each sound is.

3. Catch a grasshopper, cricket, or frog. Try to find their eardrums. Use a magnifying glass to help you.



**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Sounds Around You." You may also wish to encourage the children to make up additional activities related to sound.

**Answers for "What Am I?":** 1. An echo. 2. An eardrum. 3. A vocal cord.

**Sample answers for "Fun with Words":** Bang, meow, moo, pop, gurgle, crash, crackle.

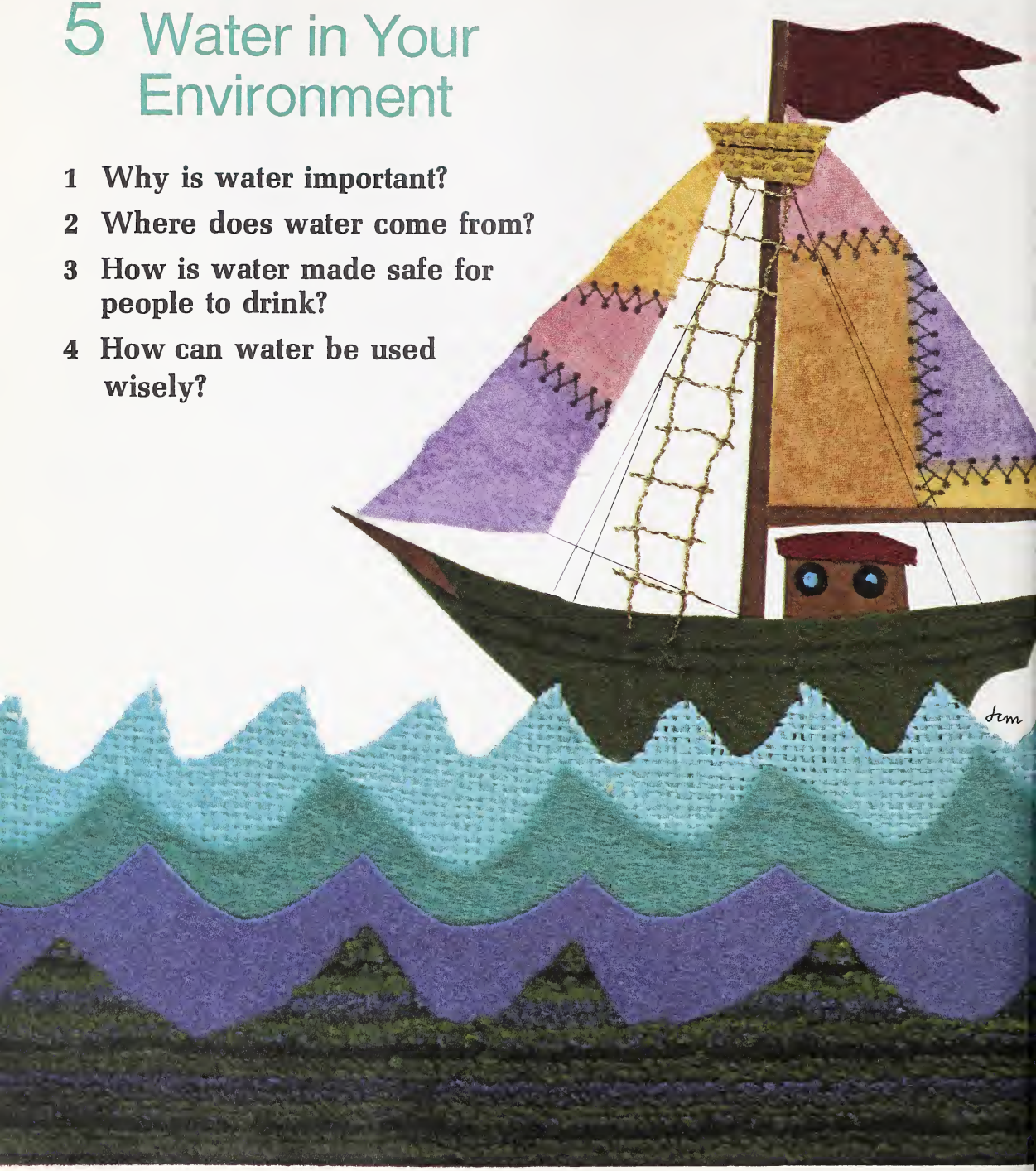
# 5 Water in Your Environment

1 **Why is water important?**

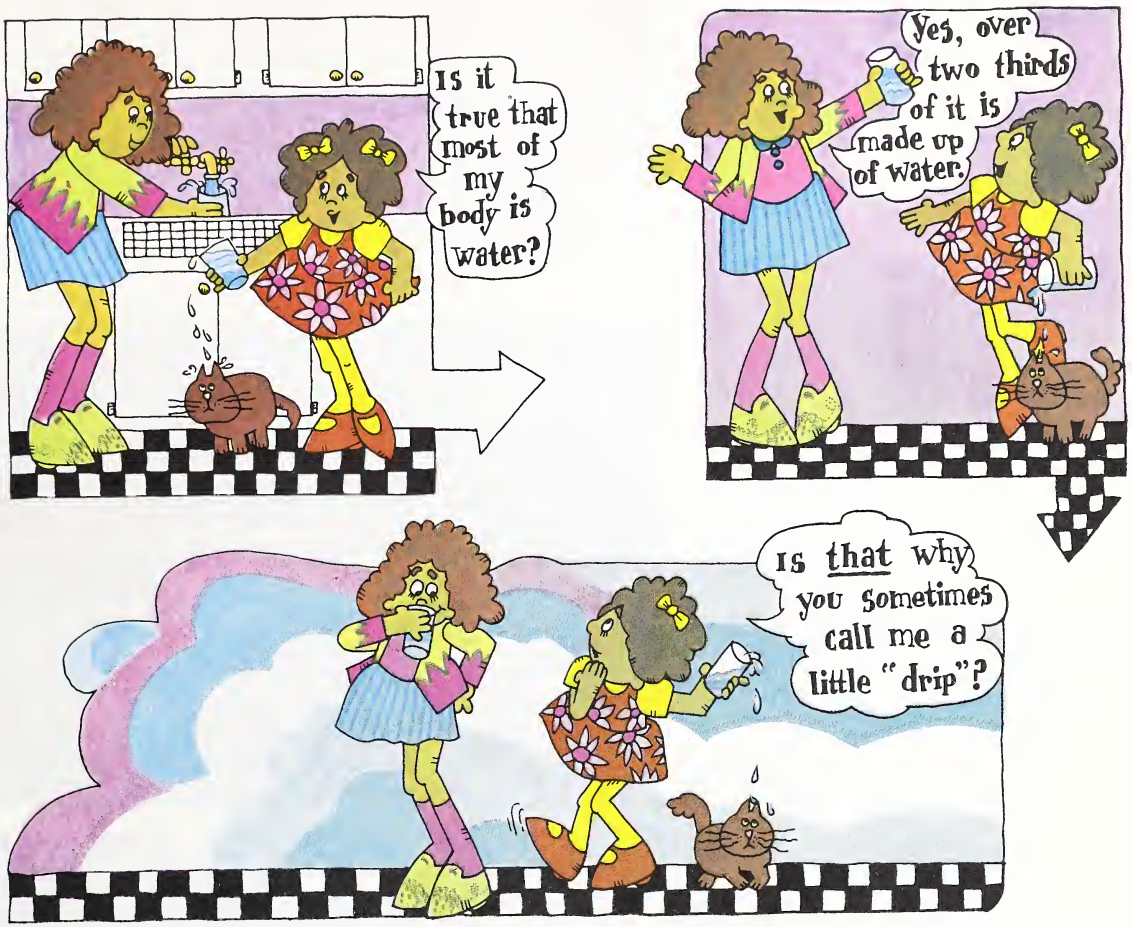
2 **Where does water come from?**

3 **How is water made safe for people to drink?**

4 **How can water be used wisely?**



**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see page T14 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 132, 139, 144, 148, and 155.




In what ways do you use water? [1]

Where does the water you use come from? [2]

Do you think people will ever use up all the water on earth? Why or why not? [3]



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have the children read the questions below the cartoon and discuss their answers to the questions.

**Sample answers for questions below the cartoon:**

[1] I use water for drinking, for washing dishes, and for brushing my teeth.

[2] It comes from a lake, a river, or a well.

[3] I think people will use up all the water on the earth because there are so many people living now and because there may be even more people living in the future. I don't think people will use up all the water because there is so much water on the earth.

# 1 Why is water important?

Have you ever taken care of a plant or an animal? If so, you may know that they need many things from their *environment* [ihn-VY-ruhn-muhnt], or surroundings. One of these things is air. Another thing plants and animals need is water. And you know that you need water. Why do you think living things need water? [1]

[1] **Sample answer:** To live and grow.



**Main concepts of the chapter (pages 130–137):**
Water is important to people because their body uses it in many ways.
Water is important to people because it is used to do many things.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state two important ways their body uses water;
—list at least three things people use water to do.
**Important words:** environment, sweat, saliva, electricity.

## How your body uses water

As you most likely know, your body is made up of many parts. Some of these parts are skin and blood. But most parts of your body are made up of still other things. One such thing is water. In fact, about two thirds of your weight is water.

Your body uses this water in many ways. In what ways do you think your body uses water? [1]

[1] **Sample answer:** To help make sweat and saliva.

*To keep cool.* What if you were to run or ride a bicycle on a very hot day. Your skin would most likely become wet with *sweat*. Sweat is mostly water.

Sweat helps cool your skin. This keeps your body from getting too warm. Do you think this is important? Why or why not? [2]

[2] **Sample answers:** Yes. I don't feel good when I am too warm. Also, my body may not work right if it gets too warm.

Do you think you might feel thirsty more often after playing than after resting? Why or why not? [3]

[3] **Sample answers:** Yes. Because when I play, my body uses water to make sweat.



**Suggested activity:** When discussing "How your body uses water," you may wish to have the children feel how sweat cools their skin. For them to do this, have the children wet one hand with water and keep the other hand dry. Have them wave both hands in the air. Then you might want to ask them these questions: Which hand felt cooler? How might this activity help show that sweat cools the skin? (Sample answers: The wet hand felt cooler. Sweat makes the skin wet and, therefore, makes the skin cooler than when it is dry.)

***To change food.*** Your body also has other liquids which are mostly water. One such liquid is in your mouth. It is called *saliva* [suh-LY-vuh].

As you eat food, saliva is mixed with the food. This makes it easier for you to swallow food. But saliva also helps change some of the food you eat. Food must be changed so that it can be used by your body.

How else do you think your body uses water? [1]

[1] **Sample answer:** To help make tears and blood.

## FINDING OUT

**How can you tell that saliva helps change the food you eat?**

*You will need: piece of bread*

- Place the piece of bread on your tongue. Do not chew it.

*What does the bread taste like?*

- Now, holding the bread in your mouth, mix it with saliva. Do not chew it.

*What does the bread taste like now? What caused this change?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring.
*Sample findings:* When the children first put the bread on their tongue, they probably will not taste the bread. After the children mix the bread with saliva, the bread will probably begin to taste sweet.
*Additional information:* The bread will begin to taste sweet after the children have mixed it with saliva because saliva breaks down certain parts of some foods into sugars.
*Extending the "Finding Out":* Now you might have the children discover some other foods which saliva helps change. To do this, have the children taste some different kinds of foods, such as crackers and dry cereal. Have the children follow the steps given in the "Finding Out" above as they taste the foods.

## Some other ways water is used

As you may know, your body uses water to do many things. But water is also used by people in other ways.

*To grow food.* Do you like to eat corn? Oranges? Meat? If not, what are some foods you like to eat?

As you may know, all food is made from plants or animals. And plants and animals need water to stay alive. Because of this, people use water to help grow plants and animals that are used for food. What do you think might happen if there was not enough water for these plants and animals? [1]

[1] **Sample answer:** Most of the plants and animals would probably die.



**Suggested discussion:** You may wish to use the picture above to point out that farmers sometimes have to irrigate their land. Then you might want to ask the children the following question: Why do you think irrigation is important? (Sample answer: Irrigation helps farmers grow crops in areas where there is not enough rainfall. Irrigation helps farmers grow more crops than might otherwise be possible.)

***To clean things.*** "Wash the apple before you eat it." "Help me wash the dishes." "Don't forget to brush your teeth." You most likely have heard someone say these things. They point out that cleaning things is another way you use water. How do you think cleaning things helps you? [1]

[1] **Sample answer:** It might help me kill germs that could make me sick. It might help me take better care of my teeth.

***To make food.*** Have you ever cooked some rice? Or made some lemonade? If so, you most likely know that you use water to make these things. Water is also used to make other foods. What are some other foods you know of that water is used to make? [2]

[2] **Sample answer:** Soda, some canned fruit juices, cakes, soups.

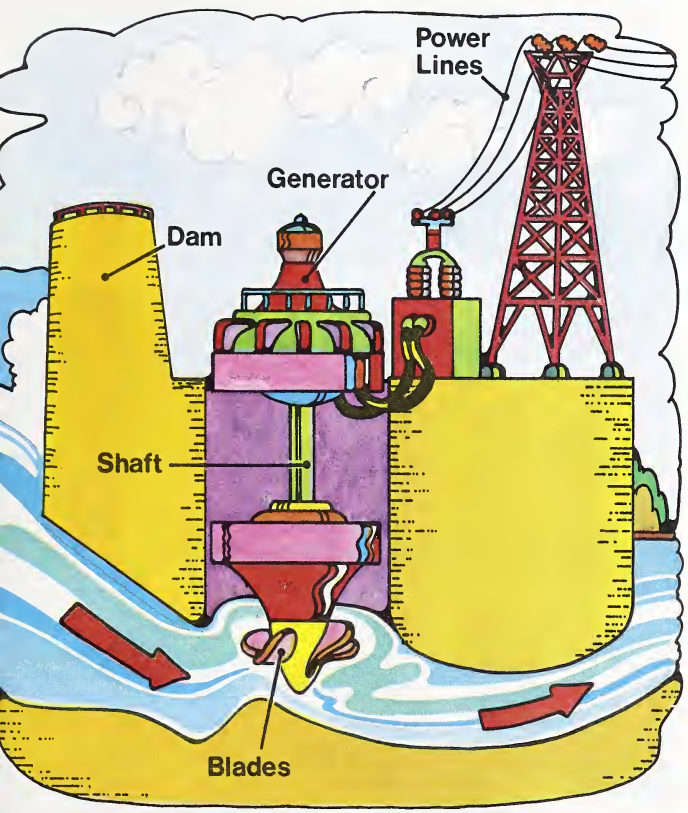


**Suggested activity:** When discussing "To make food," you may wish to emphasize that there are many kinds of food products people use which are made with water. Then you might ask the children to make a list of all the food products they have in their home which call for the addition of water to make the food. You might then have the children compare their lists to discover how many kinds of such food products they have found.

***To make electricity.*** Water can be used to make *electricity* [ih-LEHK-TRIHS-uht-ee]. The picture on this page shows how water is used to make electricity.

You most likely use many things that are run by electricity. A toaster and a radio are such things. What other things do you use that are run by electricity? [1]

[1] **Sample answer:** Television, light bulbs, record player.




*Rushing water from a dam can be used to make electricity. The water spins the blades and shaft of a machine called a generator. This spinning motion causes electricity to be made in the generator. How do you think this electricity gets to homes and other places?*



**Sample answer for the caption:** Through power lines.

*To have fun.* The pictures on this page and the next show people having fun with water. In what ways are they having fun with water? In what ways have you had fun with water? [1]

[1] **Sample answer:** Swimming, playing, fishing, ice-skating, water-skiing, snow skiing, boating, tobogganing.



**Suggested activity:** After discussing "To have fun," you may wish to have the children bring in pictures that show ways they have had fun with water. Or you may wish to have the children draw pictures that show ways they have had fun with water.

### For You to Think About

In this chapter, you may have read about many ways people use water. What other ways can you think of that people use water?

## *A Second Look*

1. In what ways does your body use water?
2. What are some other ways people use water?
3. What are some things water is used to make?

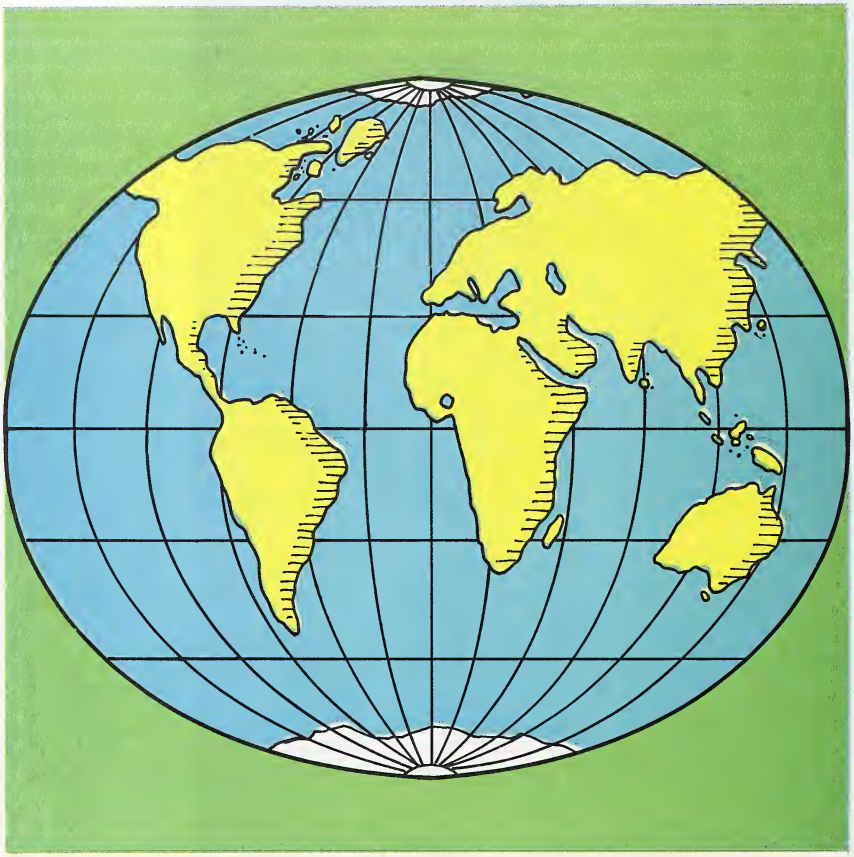


**Sample answers for "A Second Look":** 1. My body uses water for keeping cool and for changing food. 2. Some other ways people use water are for growing food, for cleaning things, for making food, for making electricity, and for having fun. 3. Some things water is used to make are lemonade, rice, and electricity.
**Sample answer for "For You to Think About":** To travel, help make paper, cool certain machinery.

## 2 Where does water come from?

What if you were to look at a map of the earth. You would see that most of the earth is covered with water. Some of this water is found in lakes and rivers. But most of the water on earth is found in oceans. This water is different from water in lakes and rivers. How might it be different?[1]

[1] **Sample answer:** Ocean water has salt in it.





**Main concepts of the chapter (pages 138-144):**
There are two kinds of water on the earth, namely salt water and fresh water.
The constant movement of water is essential to life on the earth.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—name the two kinds of water found on the earth and state an example of where each kind can be found;
—explain the movement of water on the earth and why such movement is important.

**Important words:** salt water, fresh water, evaporates, water vapour.

## Salt water

Have you ever tasted ocean water? If so, you most likely know that it tastes salty. Ocean water has salt in it. Because of this, ocean water is called *salt water.*

Though most of the earth is covered with ocean water, you cannot drink it. Ocean water has so much salt in it that it would be harmful to you. It would also be harmful to many plants and animals.


## FINDING OUT

**In what way is salt water harmful to a plant?**

*You will need: 2 plants, salt*

- Put both plants where they will get about the same amount of sunlight.
- Mix about 2 teaspoons of salt with a cup of fresh water. (This water may be thought of as ocean water although ocean water also has other things in it.)
- Water both plants every 2 or 3 days. Give one plant fresh water. Give the other plant salt water.

*Was the salt water harmful to the plant? If so, how could you tell?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing.
*Sample findings:* After the children have watered the plant with salt water for a few days, they will most likely observe that the leaves on the plant curl or turn yellow. The plant may also fall over and die.
*Extending the "Finding Out":* You may wish to have the children find out if fresh water is harmful to ocean plants. The children will need two ocean plants (from a pet store) to do this. Have the children place one plant in a container with salt water and the other in a container with fresh water. Have the children observe the plants for a few days. Then you might want to ask them these questions: Is fresh water harmful to ocean plants? If so, how could you tell? (Sample answers: Yes. The plant died.)

## Fresh water

As you may know, most of the water on earth is salt water. But the water you use is called *fresh water*. Fresh water may have some salt in it, but not enough to be harmful to you.

Fresh water can be found in many places. Where might you find fresh water? [1]

[1] **Sample answer:** In rivers and lakes.

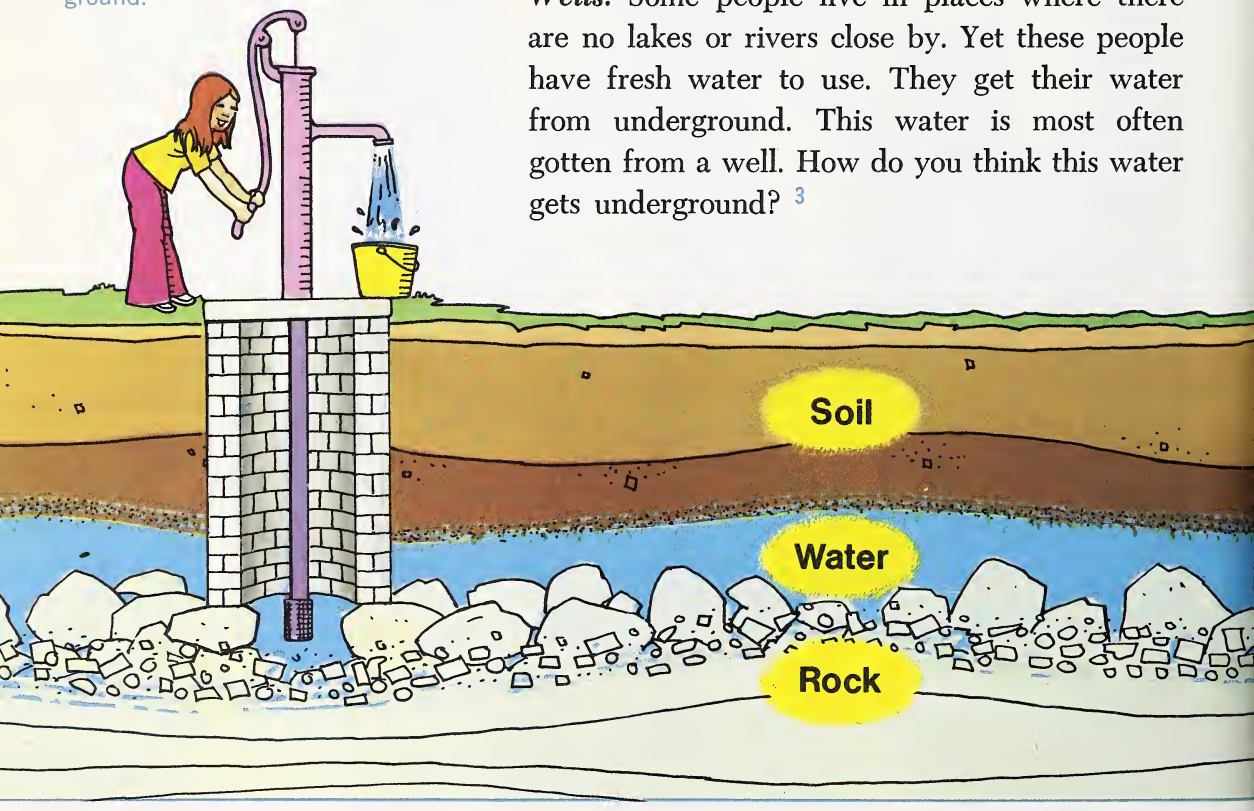
***Lakes and rivers.*** Is there a lake near where you live? Or maybe a river? If so, the water you use may come from this lake or river.

The water in most lakes and rivers is fresh water. Where else might you find fresh water? [2]

[2] **Sample answer:** In streams and wells.

[3] **Sample answer:** It soaks into the ground.

***Wells.*** Some people live in places where there are no lakes or rivers close by. Yet these people have fresh water to use. They get their water from underground. This water is most often gotten from a well. How do you think this water gets underground? [3]




**Suggested discussion:** You may wish to use the picture on this page to point out that wells are built with concrete or brick surrounding the long pipe and with a concrete top around the base of the pump to keep unclean water out of the well. Also, wells are dug so that the long pipe is several feet below the surface of the water. You might then want to ask the children why they think it is necessary to have this pipe several feet below the surface of the water. (Sample answer: Sometimes when it does not rain for a long time, there is very little water to soak into the ground. This can make the water level in the well lower than usual. If the pipe is not long enough to reach the lower water level, no water can be pumped out.)

## Movement of water

Because people keep using water, more fresh water is needed to keep lakes, rivers, and wells filled. Where do you think this water comes from? [1]

*Rain and snow.* You most likely have had to stop playing outside because of rain or snow. This may have made you unhappy. But rain and snow are important to you. Fresh water falls to earth as rain and snow. Rain and snow help keep lakes, rivers, and wells filled.

*Evaporation.* Water that falls as rain and snow is important to you. But how do you think water gets into the air to form rain and snow? [2]

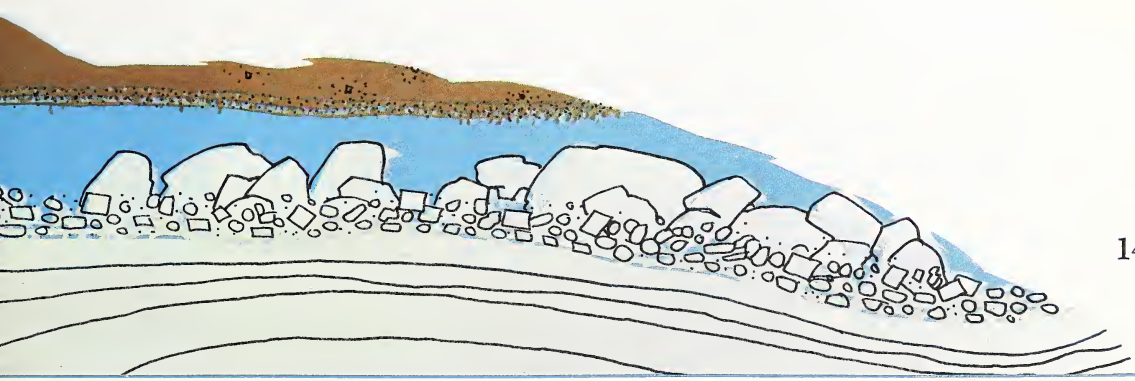
Have you ever noticed that a wet sidewalk soon dries? Or that a puddle of water soon goes away? Some of this water may go into the ground. But some of it *evaporates* [ih-VAP-uh-RAYHTS]. That is, some of the water changes into a gas called *water vapour*. As water changes into water vapour, it goes into the air.

### Exploring on Your Own

Some places have too much water. Other places have too little water. Having too much or too little water can cause problems for people. See if you can find out what some of these problems are. Also find out how these problems might be taken care of. You might use reference books to help you. Look under the headings *water, flood,* and *desert.*

[1] **Sample answer:** From rain and snow.

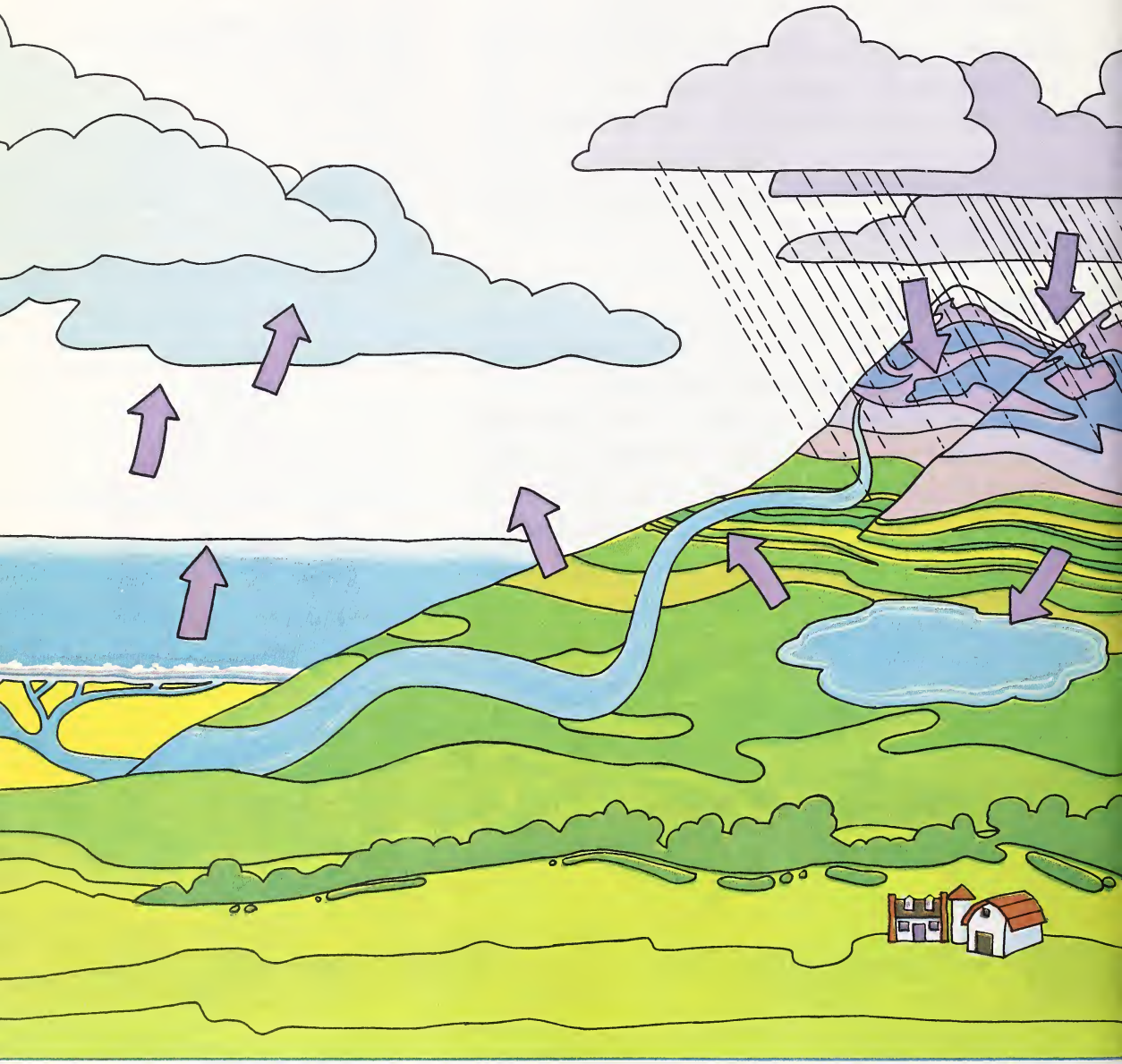
[2] **Sample answer:** By drying up, by changing into a gas, or by evaporating.





**Sample findings for "Exploring on Your Own":** Too much water can cause flooding, mud slides, and loss of soil. These problems might be taken care of by building dams, by redirecting the flow of a river, and by improving drainage. Too little water can cause loss of soil by wind and can cause loss of crops. These problems might be taken care of by storing large supplies of water and by irrigating the land.

# MOVEMENT OF WATER



**Suggested discussion:** You may wish to use the picture on this page as an aid in teaching the children about the movement of water. First have the children read the material on the movement of water on pages 141 and 143. Then have them trace the movement of water, as represented by the arrows, and explain what is happening to the water as it moves.

*Clouds.* Water vapour helps form clouds. Most clouds are formed over oceans. When ocean water evaporates, the salt is left behind.

Some of the clouds formed over oceans are blown over land. In time, the water vapour in these clouds is cooled. This makes the water vapour change into rain or snow. What things might happen if a place did not get rain or snow for a long time?[1]

**For You to Think About**

As you may know, most of the water in the air has evaporated from oceans. But the amount of water in the oceans stays about the same. How do you think water gets back into oceans?

[1] **Sample answer:** The land would dry up. Few plants and animals could live there.



**Sample answer for "For You to Think About":** Some rain and some snow fall into oceans. Rivers flow into oceans.

## FINDING OUT

**How can you show that water evaporates?**

*You will need: hot plate, 2 pans with handles, tray of ice cubes, glove*

- Put some water in a pan. Heat the water, but do not boil it.
- Put the ice cubes in the other pan. Hold this pan about 20 cm above the other pan. Be sure to wear a glove on the hand holding the pan.
- Watch for small drops of water to form on the bottom of the pan you are holding.

*What did the heat do to the water in the pan on the hot plate?*
*Where did the drops of water on the bottom of the pan with ice come from?*
*What do you think heats water on earth so that it evaporates?*

### *A Second Look*

1. How is ocean water different from fresh water?
2. Where can fresh water be found?
3. How does water get into the air?



**Teaching helps for "Finding Out":**
*Processes used:* observing, inferring, hypothesizing.
*Sample findings:* The children will most likely observe that when the water in the pan on the hot plate gets warm enough, the water will change into water vapour. When the water vapour in the air touches the bottom of the pan with ice cubes in it, the water vapour will form small drops on the bottom of the pan. The sun heats the water on the earth so that the water evaporates.
**Sample answers for "A Second Look":** 1. Ocean water is different from fresh water in that ocean water has salt in it. 2. Fresh water can be found in lakes, in rivers, and underground. 3. Water gets into the air by evaporation.

# 3 How is water made safe for people to drink?

What if you had two glasses of water. One glass is filled with water from a river. One glass is filled with water from a water faucet. In what way might the glasses of water look different from each other? [1] Which glass of water would probably be safer to drink? Why? [2]

## The need for clean water

You most likely know that fresh water can be found in lakes and rivers. But this water is not always clean. It may have things in it such as dirt and soap. These things are called *wastes*. This water may also have *germs* in it. Wastes and germs make water unclean. Where might wastes and germs come from? [3]

[1] **Sample answer:** The river water looks dirty.

[2] **Sample answers:** Water from the faucet. Because it looks clean.

[3] **Sample answer:** From unclean water put into lakes and rivers by cities and by factories.



**Main concepts of the chapter (pages 145–149):**
Water in many lakes and rivers may be unclean.
A water-treatment plant makes water safe for people to drink.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—name two things that can make lake and river water unclean;
—describe how a water-treatment plant makes water safe for people to drink.

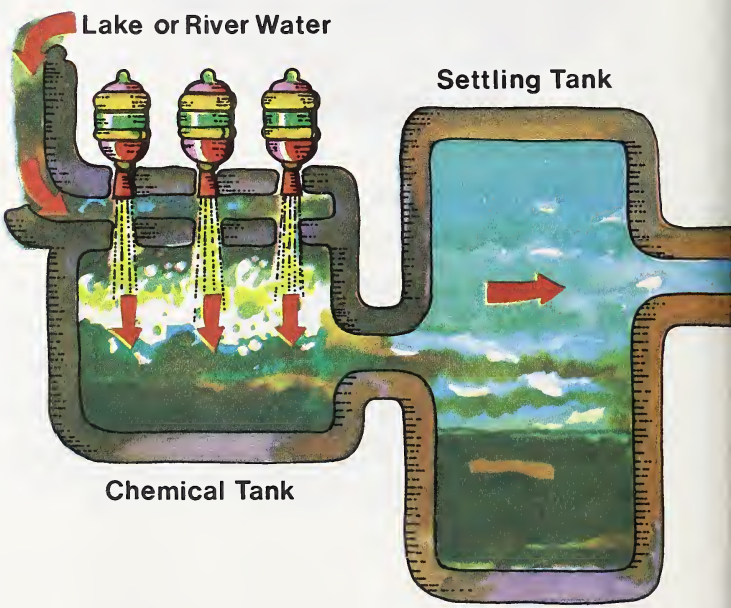
**Important words:** wastes, germs, water-treatment plant.

Unclean water should not be used by people for drinking. Wastes and germs in the water can sometimes make people sick. These things can also hurt plants and animals. How might water be made safe for people to drink? [1]

[1] **Sample answer:** By taking out the wastes and the germs.

## Looking at a water-treatment plant

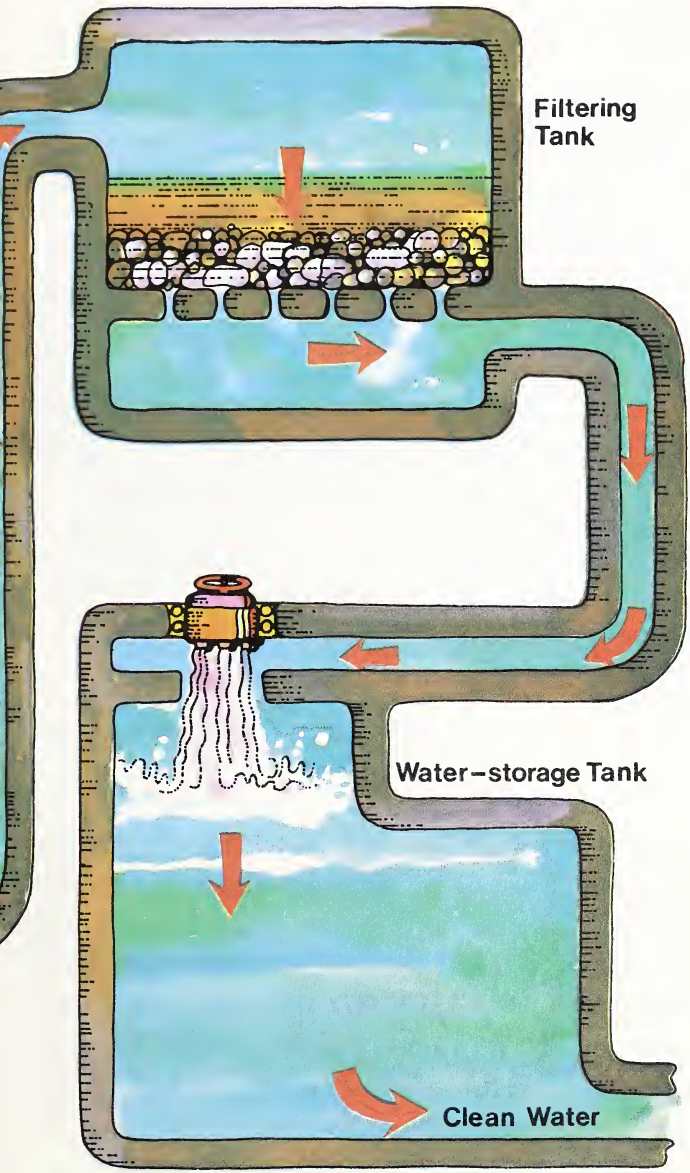
Most cities and towns get their water from a lake or river. But before the water goes to homes and other places, it goes to a water-treatment plant. Here the water is made safe for people to drink. The picture found below and on the next page shows how this is done.




*In a water-treatment plant, water is pumped into a chemical tank. Here, chemicals are mixed with the water. The water then goes into a settling tank. Here, the chemicals cause many of the wastes to fall to the bottom of the tank.*



**Suggested activity:** After discussing "Looking at a water-treatment plant," you may wish to have the children see how a certain chemical (alum) helps take wastes out of water. The children will need 2 glass jars of muddy water and about a teaspoon of crushed alum (from a drugstore). Have the children add the alum to one jar and then shake both jars. After the contents of both jars have settled for a few minutes, have the children compare the contents of both jars. You might then want to ask them these questions: Do you think that the chemical helped take some of the wastes out of the water? If so, how could you tell? (Sample answers: Yes. Because most of the wastes fell to the bottom of the jar.)




*Next, the water leaves the settling tank and goes into a filtering tank. Here, the water is filtered through sand and other things. How might this help clean the water?*

*After the water has been filtered, it goes into a water-storage tank. More chemicals are added to the water to kill germs. Why do you think this is important?*



**Suggested activity:** After discussing "Looking at a water-treatment plant," you might want to take the children on a field trip to a local water-treatment plant.

**Sample answer for the top caption:** By taking most of the wastes and the dirt out of the water.
**Sample answer for the bottom caption:** Because certain germs can make people sick.

## FINDING OUT

**How does a filter help clean water?**

*You will need: empty milk carton, small glass jar, 2 or 3 pieces of charcoal, clean sand, cotton, muddy water*

- Make some small holes in the bottom of the carton.
- Put some cotton inside the carton as shown.
- Then put some sand on top of the cotton.
- Crush the charcoal and put it on top of the sand.
- You have made a filter somewhat like those used in water-treatment plants.
- Hold the carton over the glass jar and pour some muddy water into the carton.

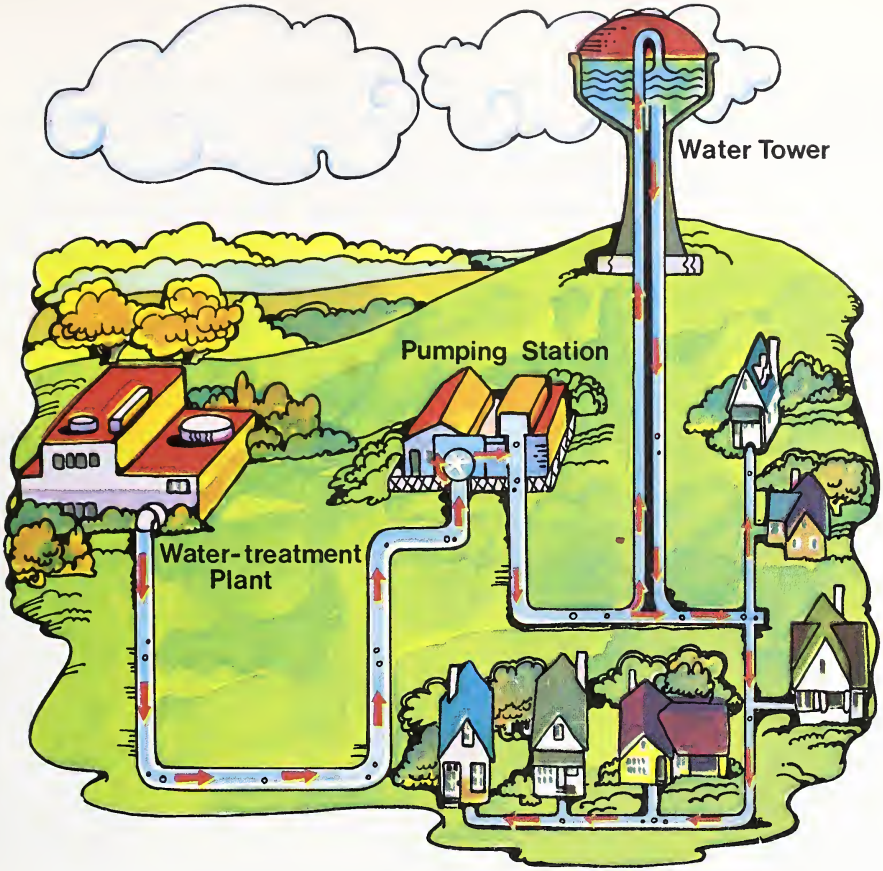
*In what way does the filtered water look different from the muddy water?*
*In what way does a filter help clean muddy water?*

After the water has been made safe for people to drink, it leaves the water-treatment plant. The water is pumped into large pipes. These pipes are underground. They carry water to homes and other buildings. The pipes may also carry some of the water to a water tower. A water tower is used to store water. Why might it be important to store water? [1]

[1] **Sample answer:** To make sure there is always enough water for people to use.



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring. *Sample findings:* The children will most likely notice that the filtered water does not look as muddy as it did before it was poured through the filter. As a result, the children will probably infer that a filter helps clean water by taking some of the dirt out of the water.
**Suggested discussion:** After completing the "Finding Out," you might want to point out to the children that although the water they just poured through their filter looks cleaner than before, the water is still not safe to drink. You might then want to ask them this question: Why do you think this filtered water is not safe to drink? (Sample answer: There still might be germs in the water.)




HOW WATER GETS TO MANY PLACES

## *A Second Look*

1. What things may make lake and river water unclean?
2. What does a water-treatment plant do?
3. How does clean water get to homes and other places?



**Sample answers for "A Second Look":** 1. Lake and river water may be made unclean by wastes and and by germs. 2. A water-treatment plant makes water safe for people to drink by removing wastes and germs. 3. Clean water gets to homes and other places through underground pipes.

# 4 How can water be used wisely?

As you may know, there are more people living now than ever before. Therefore, more fresh water is being used now than ever before. To make sure there will be enough water, it is important for people to use water wisely. In what ways might people use water wisely? [1]

[1] **Sample answer:** By not wasting water while cleaning something. By not emptying wastes into lakes, rivers, and oceans.

## Saving water

The pictures on this page show some people using water. Which person is saving water? How is that person saving water? [2]

[2] **Sample answers:** The girl. By turning off the faucet when she is not using the water.



**Main concepts of the chapter (pages 150–155):**
People need to use water wisely so that there will always be enough water for everyone.
There are many things people can do to use water wisely.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state why it is important to use water wisely;
—state three ways in which people can use water wisely.
**Important word:** polluted.

The table on this page shows some things people clean with water. The table also shows how much water might be used to clean these things. What might people do to save water when washing a car? When washing dishes? When cleaning their body? [1]

How else might people save water? [2]

[1] **Sample answers:** Use a bucket. Wash dishes by hand. Take a shower.

[2] **Sample answer:** By using only the water needed to do a certain job.

**Some Ways People Can Save Water**

| Use of water | Amount of water used |
|---|---|
| | litres |
| *Washing a car* | |
| with a hose and running water | 76 |
| with a bucket of water | 19 |
| *Washing dishes* | |
| with a dishwashing machine | 57 |
| by hand | 19 |
| *Cleaning their body* | |
| by taking a bath | 133 |
| by taking a shower | 95 |

## Controlling water pollution

As you may know, people use water in many ways. After people use water, it often has wastes and germs in it. For years many cities and factories have emptied this water into lakes and



**Suggested activity:** After discussing "Saving water," you may wish to involve the children in an activity that would help them discover ways they can save water. Have the children keep a list of things they do for one week that help save water. Then have the children share their ideas for saving water.

rivers. Because of this, the water in lakes and rivers has become *polluted* [puh-LOOT-uhd]. That is, the water has become unclean.

Many cities and factories now treat water before it is put back into lakes and rivers. To do this, they take some of the wastes and germs out of the water. This helps to control water pollution. Do you think this is important? Why or why not?[1]

[1] **Sample answers:** Yes. Because water that is too polluted cannot be used by animals, plants, or people.

*The pictures on these pages show polluted water. What might people do to help stop water pollution?*



**Sample answer for the caption:** Avoid throwing trash and other things into lakes, rivers, and oceans.

**Suggested research:** After discussing "Controlling water pollution," you may wish to have the children find out what is being done in their community to control water pollution. You might help them contact the local board of health to learn about things their community is doing to control water pollution.



**Suggested activity:** You may wish to introduce a class project at this point through which the children can emphasize the importance of conserving water and controlling water pollution. You might suggest that the children make up posters or skits that would emphasize the importance of conserving water and controlling water pollution. You might then have the children make a bulletin-board display with their posters or act out their skits for their classmates.

## Changing salt water into fresh water

In time, there may be even more people living than there are now. So the need for water will be even greater. People may have to get their water from oceans. To do this, they will have to change salt water into fresh water.

The pictures on this page show one way salt water can be changed into fresh water. Do you think it is important to keep oceans from becoming polluted? Why or why not? [1]

[1] **Sample answers:** Yes. Because in time people may need to change salt water from oceans into fresh water.

*This girl is trying to change salt water into fresh water. She is doing this by freezing the salt water. Of course, much more salt water would have to be frozen to supply a town with fresh water! See if you can change salt water into fresh water in this way.*




**Teaching helps for the pictures above:** To get the best results from the activity suggested in the pictures above, tell the children not to let the ice freeze solid. Instead, the children should skim off a thin layer of ice every hour or so. Also tell the children to rinse the ice quickly and then to let it melt in a glass or a cup. When the children taste this water, they will probably taste some salt in the water, but they should taste less salt in this water than in the salt water with which they began. (When salt water freezes, most of the salt is separated from the ice crystals. Rinsing the ice removes most of the salt.)


## FINDING OUT

**How can you change salt water into fresh water?**

*You will need: salt, drinking glass, clear plastic kitchen wrap, rubber band, black paper*

- Mix about 2 teaspoons of salt with a glass of water.
- Stretch a piece of plastic kitchen wrap tightly over the top of the glass. Put a rubber band around the glass to hold the wrap in place.
- Place the glass on a piece of black paper in the sunlight near a window.
- After about an hour you should see some water on the underside of the plastic wrap. Remove the wrap from the glass. Taste the water on the wrap and in the glass.

*Which water was fresh water?*
*Do you think the sun helped change the salt water into fresh water? If so, how?*

## *A Second Look*

1. Why is it important for people to use water wisely?
2. What are some cities and factories doing to help control water pollution?
3. Why is being able to change salt water into fresh water important?



**Teaching helps for "Finding Out":**
*Processes used:* observing, comparing, inferring. *Sample findings:* The children will most likely discover that the water on the plastic wrap is fresh water. They may infer that when the heat from the sun caused some of the salt water to change into water vapour, the salt was left.
**Sample answers for "A Second Look":** 1. It is important for water to be used wisely because more water is being used now than ever before. 2. Some cities and factories are helping to control water pollution by taking some of the wastes and the germs out of the water they use before this water is put back into lakes and rivers. 3. Being able to change salt water into fresh water is important because in time the need for fresh water will be even greater than it is now.

# Workers Who Use Science

It is important for people to use water wisely. Because of this, there are many workers who study water and look for ways to use water wisely. One such worker is a *hydrologist* [hy-DROL-uh-juhst].

One thing a hydrologist does is study the ground in certain places. A hydrologist finds out how much water might be underground in those places. This helps people know where to dig for a well.

Another thing a hydrologist does is help people find ways of storing water. A hydrologist might study a river to find the best place to build a dam. A dam can be used to help store water for a city.

*A farmer wants to know how deep to drill for water in this place. This hydrologist is using a special machine to find out.*

To find out more about how a hydrologist helps people use water wisely, try to find the answers to these questions:

How might the work of a hydrologist be helpful to farmers in growing food?[1]

How might the work of a hydrologist be helpful to people living near a river that often floods?[2]

How else might the work of a hydrologist be helpful to people?[3]

Along with sources of your own, you might find that writing to the following source may help you.

The Geological Association of Canada, Department of Earth Sciences, University of Waterloo, Waterloo, Ontario N2L 3G1.



**Sample answers for "Workers Who Use Science":**

[1] The work of a hydrologist might be helpful to farmers in growing food in that a hydrologist can help find new supplies of fresh water for farmers.

[2] The work of a hydrologist might be helpful to people living near a river that often floods in that a hydrologist can make certain suggestions to help these people. Such suggestions might include changing the course of the river, building a dam, and building new homes in areas near the river which are less likely to flood.

[3] The work of a hydrologist might also be helpful to people in determining the amount of pollution in bodies of water and in determining the source of such pollution.

## Reviewing the Main Ideas

Some of the ways your body uses water are to keep cool and change the food you eat.

People also use water to grow food, clean things, make things, and have fun.

Most of the water on earth is found in oceans. Ocean water is salt water.

The water you use is fresh water. Fresh water can be found in wells and in most lakes and rivers.

When water evaporates, it changes into water vapour and goes into the air. Water vapour helps form clouds.

When water vapour in clouds is cooled, it changes into rain or snow.

A water-treatment plant makes water safe for people to drink.

People can use water wisely by saving water, controlling water pollution, and changing salt water into fresh water.

## Reading About Science

Gans, Roma. *Water for Dinosaurs & You.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1973.

Lefkowitz, R.J. *Water for Today & Tomorrow.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1973.

Russell, Helen R. *Water: A Field Trip Guide.* Toronto, Ontario: Little, Brown & Co. (Canada) Ltd., 1973.



**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 158.

**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of water. Such articles might be found in reference books under the headings *ocean, oceanography, water, salt water, fresh water,* and *water pollution.*

# Testing for Understanding

**Ideas to Check**

On your paper write *T* for each sentence below that is true. Write *F* for each sentence that is false.

F 1. Most of the water on earth is fresh water.
T 2. Plants and animals need water to stay alive.
T 3. Water can be used to make electricity.
T 4. Water vapour helps form clouds.
T 5. Saving water is one way people can use water wisely.
F 6. When water vapour in clouds is warmed, it is changed into rain or snow.

Write on your paper the word or words that best fit in each blank below. Choose from these words: *evaporates, saliva, fresh water, water-treatment plant, salt water, polluted, sweat, germs.*

1. When you eat food, ____ helps change the food so that it can be used by your body.
2. When your body gets too warm, ____ from your body helps cool your skin.
3. Ocean water is also called ____.
4. The water you drink and use in many other ways is called ____.
5. A ____ makes water safe for people to drink.
6. When water ____, it changes into a gas and goes into the air.

**Words to Use**

saliva
sweat
salt water
fresh water
water-treatment plant
evaporates



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Water in Your Environment" are provided for you on page T20 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional test questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**Brainteasers**

1. When you take a warm bath or shower, you may have noticed that the mirror or window in the bathroom gets "cloudy." Why does this happen?
2. Sometimes a city water pipe may break. After the pipe has been fixed, people may be asked to boil the water that comes into their home. Why?

**Fun with Words**

Some words can be written in a way that shows their meaning.


Draw some other words about water in a way that shows their meaning.

**Things to Do**

1. Many homes have a water meter. It measures how much water is used in your home. Find out if there is a meter in your home. If there is, find out how much water your family uses in a month and how much it costs. Ask someone in your family to help you.

2. Think of as many ways as you can to change salt water into fresh water. You might try freezing salt water. You might try filtering it. Find out which way is best.

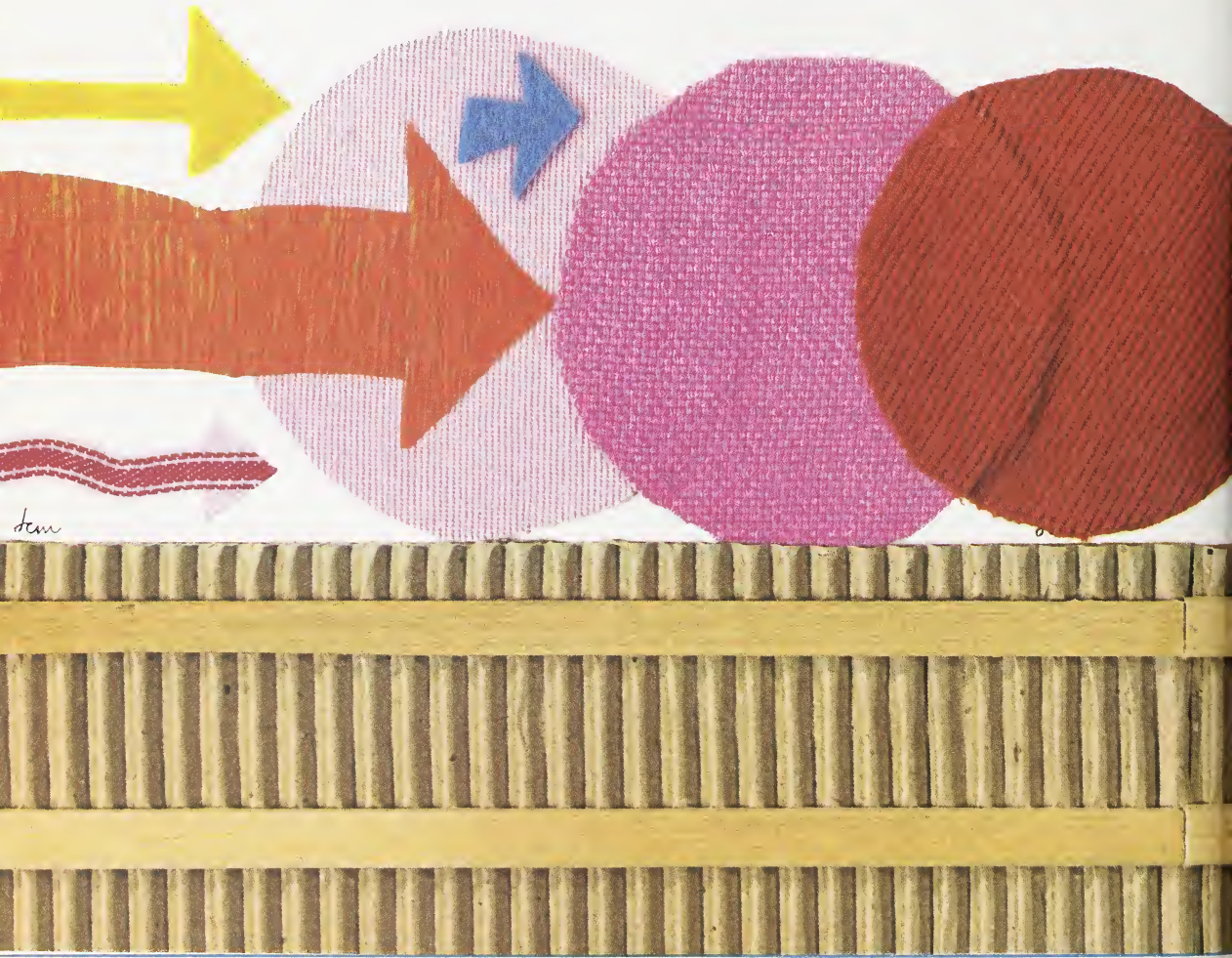


**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Water in Your Environment." You may also wish to encourage the children to make up additional activities related to the topic of water.

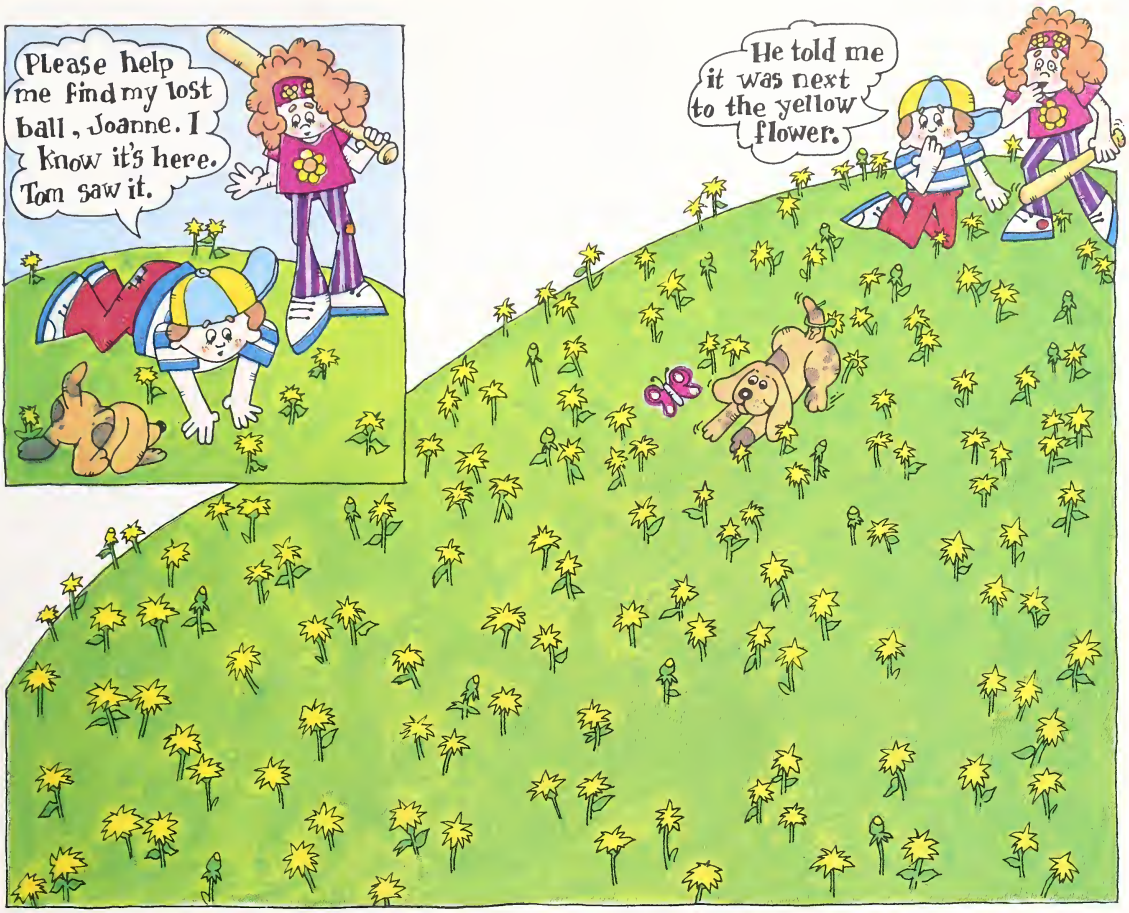
**Sample answers for "Brainteasers":** 1. Water vapour in the air collects on cool surfaces. 2. The break in the pipe may have allowed dirt and germs into the water. Boiling water for approximately twenty minutes will kill most harmful germs.
**Suggested additional words for "Fun with Words":** Rain, sleet, hail, waves.

# 6 Location, Motion, and Force





**Preparing for the unit:** For a list of instructional materials helpful in teaching this unit, see pages T14–T15 of the Teacher's Manual. You may also wish to check the list of materials needed for each "Finding Out" activity in this unit and have the children begin collecting these materials. These activities are found on pages 165, 171, 177, and 181.




Do you think what Tom said was helpful in finding the ball?[1] Why or why not?[2]

When have you had to tell someone where to find something? What did you say to that person?



**Introducing the unit:** You may wish to have the children read the cartoon above. Then have the children read the questions below the cartoon and discuss their answers to the questions.

**Sample answers for questions below the cartoon:**

[1] I don't think what Tom said was helpful.

[2] What Tom said was not helpful because the ball could have been next to any one of the yellow flowers.

# 1 Where are you?

Name some of the places where you have been yesterday and today. Have you been to a park? A friend's house? A store? Where are you now?

The place where you are at any time is your *location* [loh-KAY-shuhn]. Why do you think it is important to know your location?[1] When might it be important to know the location of things around you?[2]

[1] **Sample answer:** So I do not get lost.

[2] **Sample answer:** When I want to find something or someplace.




**Main concepts of the chapter (pages 162–166):**
The place where a person is at any time is that person's location.
Reference objects are used to help tell about the location of something.
There are times when it is important to know just how near or how far something is from you.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state their location at any time by using reference objects;
—state two examples of times when it is important to know just how near or how far something is from them.
**Important words:** location, reference objects.

## Using reference objects

What if you wanted to visit a new friend. You would have to know the location of your friend's house. To help you find the house, your friend might say, "My house is the white house across from Bell School and next to Brown's Store." Bell School and Brown's Store are used to help tell where the house is. Things that are used to help tell about the location of something are called *reference objects.*

Think about the location of the place where you live. What reference objects would you use to help tell about its location?

Look around you and choose something as a reference object. What is your location? Are you *in front* of the object or *behind* it? Are you *near* the object or *far* from it? What other words might you use to help tell about your location?[1]

**For You to Think About**

Suppose you lost your way while traveling someplace. What would you do, and why?

[1] **Sample answer:** Above, below, to the left, to the right.

## Knowing how near or how far

As was said, *near* and *far* are words you might use to help tell about your location. But there are some times when you need to know just *how near* or *how far* something is from you. When are some of these times?[2]

The map on the next page shows the location of some of the places in a town. Look at the map and find the place marked "Your Home." How

[2] **Sample answer:** When I am about to cross a street. When I want to go someplace I have never been before.



**Suggested discussion:** After discussing "Using reference objects," you may wish to have the children practice selecting reference objects. For them to do this, you might ask the children the following question: What reference objects would you use to help tell about the location of your school? You might then have the children choose different locations within the school and give reference objects for each location they choose.

**Sample answers for "For You to Think About":** I might look to see if I recognized anything. I might ask someone how to get to a familiar place. If I had a map, I would use the names of the streets where I am standing to find my location on the map.


**Suggested research and discussion:** After discussing "Using reference objects," you may want to have the children look at a street map of their town or city. Then you might have the children find where they live, and where they think the main part of their town is. You might then ask them these questions: Why do you think this is the main part of your town? (Sample answer: Because most of the stores are there. Because the two biggest streets in town cross there.) How far do you live from the main part of town? Why do you think it might be important to know this? (Sample answer: So I'll know if it is close enough to walk to or too far to walk to.)

far is it from "Your Home" to the zoo? The pet shop? The school? The train station? [1]

Suppose you had to choose whether to walk, ride a bike, or ride a bus to each of these places. How would you get to the zoo? Why? The pet store? Why? The school? Why? The train station? Why? [2]

[1] **Sample answers:** 8 km; 5 blocks; 2 blocks; 7 blocks.

[2] **Sample answers:** I would go to the zoo by bus because it is too far to walk or ride my bike. I would probably walk to the pet store and the school because they are close to my home. I would ride my bike to the train station because it might be too far to walk.

## FINDING OUT

**What places in your neighbourhood are important to you?**

*You will need: paper, pencil, crayons*

- Using the pencil, draw a map of your neighbourhood. Be sure to show the place where you live.
- Show some other places in your neighbourhood that are important to you.

*Why are they important?*

- Label the important places that are on your map.
- Draw a line to show how you get to each of these places from where you live.

*To which of these places do you walk? Ride a bike? Ride in a car?*



**Teaching helps for "Finding Out":**
*Processes used:* communicating, classifying, using spatial relationships, interpreting data.
*Sample findings:* The children will most likely show places in their neighbourhood such as their school, a grocery store, the fire department, and perhaps a playground.


Look at the pictures on this page. What are the children doing? [1] Why is it important for these children to know just how far something is from them? [2]

[1] **Sample answer:** Jumping rope and crossing the street.

[2] **Sample answer:** So they will not be hit by the rope or walk into the path of a car.

## *A Second Look*

1. What is meant by your location?
2. When might you use reference objects?
3. What are some words that help tell about the location of something?



**Sample answers for "A Second Look":** 1. My location is the place where I am at any time. 2. I might use reference objects when I want to tell someone where my house is. 3. Some words that help tell about the location of something are behind, in front, near, and far.

## 2 Moving along

How many times have you moved, or changed your location, today? What things do you see moving as you look around you? Everything that is moving is said to be in *motion* [MOH-shuhn].

You move many things each day. What are some things you might want to move? Why might you want to move them?[1]

[1] **Sample answers:** I might want to move a pencil to write and move a bicycle to go someplace.



**Main concepts of the chapter (pages 167–173):**
When something is in motion, it may move in either a straight line or a curved line.
Things will not move unless something starts them moving.
Things will keep moving unless something stops them.
People can find out about the way some things move by looking at their tracks.

**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—identify when an object is moving in a straight line and when an object is moving in a curved line;
—give examples of things that start something moving and things that stop something moving;
—identify the way some things move by the tracks they make.

**Important words:** motion, tracks.

## Straight or curved?

Whenever something is in motion, it may move in a straight line. Or, it may move in a curved line. The pictures on this page show some things in motion. Which things are moving in a straight line?[1] Which things are moving in a curved line?[2]

What other things can you think of that move in a straight line?[3] What other things can you think of that move in a curved line?[4]

[1] **Sample answer:** The bicycles.

[2] **Sample answer:** The ride shown at the top left and the one on the right.

[3] **Sample answer:** Usually cars and airplanes.

[4] **Sample answer:** Merry-go-round, ball.



**Suggested activity:** After discussing "Straight or curved?" you may wish to have the children collect or draw pictures of some things that move in straight lines and some things that move in curved lines. You might then have the children make a bulletin-board display using the pictures they have collected or drawn. Have them sort their pictures into two groups—one group showing things that move in a straight line and the other group showing things that move in a curved line.

## A funny thing about motion

Can you ever be moving and not moving at the same time? Think back to a time when you were riding in a car or bus. The car or bus was moving you from one location to another. But you were sitting still in your seat as you rode along.

When are some other times you or something else might be moving and not moving? [1]

[1] **Sample answer:** While skating. While riding a bicycle.

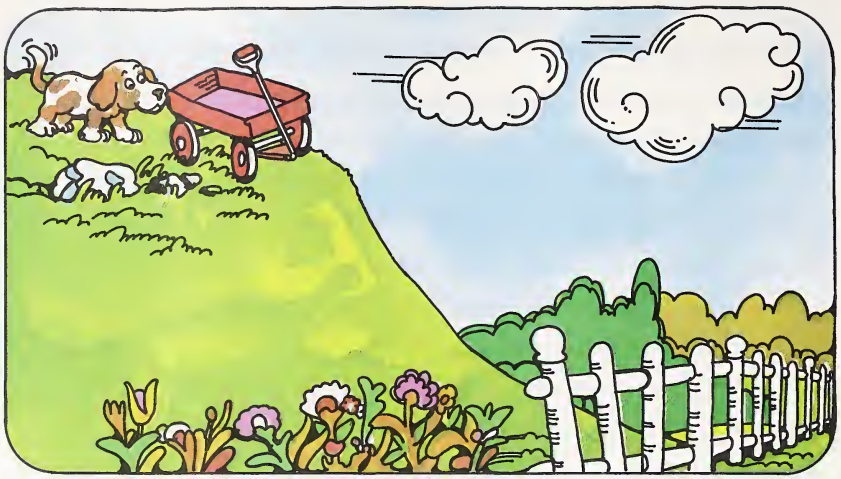
*The girl in this picture is both moving and not moving. How can this be so?*

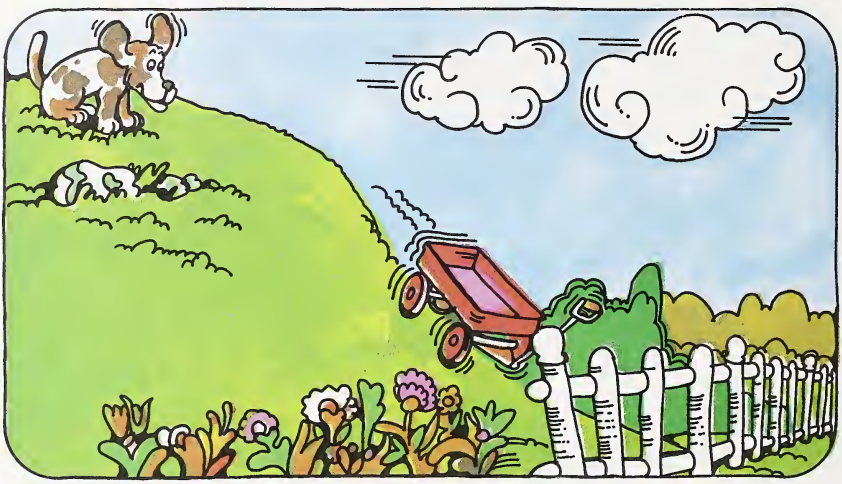
As you may know, the earth is always moving around the sun. So, everything on earth is always moving around the sun. It may not seem like you are moving. But you are moving along with the earth. Why does it seem like you are not moving? [2]

[2] **Sample answer:** Because all the reference objects around me are moving at the same speed I am.



**Sample answer for the caption:** Because she is lying still on the sled, yet the sled is moving her from one location to another.





## Starting and stopping

The pictures on this page show something else about motion. That is, things will not move unless something starts them moving. And things will keep moving unless something stops them.



**Suggested activity:** After discussing "Starting and stopping," you may wish to teach the children a game which involves starting and stopping. To play this game, the children will need a large area for running, such as a gymnasium or playground. The game is played in the following manner: The children should spread out and begin running when you say "Go." After a few seconds, say "Freeze" and all the children should stop and not move until you say "Go" again. Any of the children who cannot keep from moving during the "freeze time" are eliminated from the game. The last child to stay in the game gets to be the leader for the next game.

Look at the first picture. Could the wagon start to move by itself? Why or why not?[1] What are some other ways things might start moving?[2]

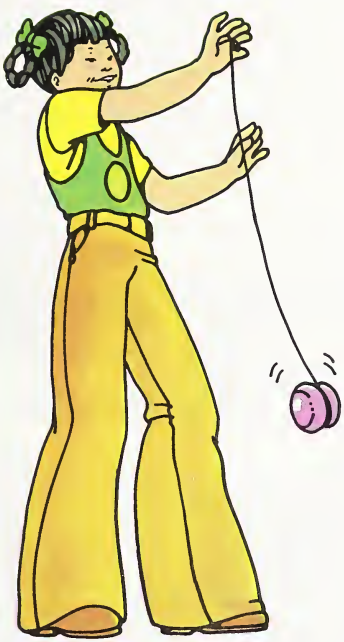
Now look at the second picture. What do you think will happen when the wagon gets to the bottom of the hill? Why?[3] What are some other ways things might stop moving?[4]

[1] **Sample answers:** No. Because the wagon needs something to start it moving.

[2] **Sample answer:** By being pushed, pulled, thrown, or dropped.

[3] **Sample answers:** It will stop. Because it will hit the fence.

[4] **Sample answer:** By hitting the ground or by being caught.



## FINDING OUT

**How can you keep a yo-yo moving?**

*You will need: yo-yo*

- Spin the yo-yo down its string. Wait until it stops spinning.

*What started the yo-yo spinning?*
*What stopped it from spinning?*

- Spin the yo-yo down its string again.
- Try to make the yo-yo move up and down on its string 3 or 4 times.

*What did you have to do to keep the yo-yo moving up and down?*



**Teaching helps for "Finding Out":**
*Processes used:* observing, communicating, experimenting.
*Sample findings:* The children will most likely say that they started the yo-yo spinning and that the end of the string stopped the yo-yo from spinning. The children will most likely observe that they must move the string up and down to keep the yo-yo moving.

## Where did they go?

You can often find out much about the way things move by looking at the *tracks,* or marks, they leave.

The picture on this page shows some animal tracks. Which of the animals came from the house? Which of them came from the tree? Which animals came from over the hill? [1] What else can you find out by looking at the tracks? [2]

The boy in the top picture on the next page is looking for his brother and his dog. What can he find out from looking at their tracks? [3] When have you used tracks to find something?

Look at the bottom picture on the next page. See how many tracks you can find.

What other things can you think of that show tracks? [4]

### For You to Think About

Many times the police use tracks of cars to find out how an accident happened. How do you think these tracks might help them do this?

[1] **Sample answers:** The dog came from the house. The squirrel came from the tree. The bird and the rabbit came from over the hill.

[2] **Sample answer:** How big the animals are and what kind of animals might have made the tracks.

[3] **Sample answer:** The direction they are walking.

[4] **Sample answer:** Bicycles, horses.



**Sample answer for "For You to Think About":** They can use the tracks to find out exactly where one car hit another. They can measure the tracks to see about how fast each car was traveling before it hit the other car.

**Suggested activity:** After discussing "Where did they go?" you might have the children look for different kinds of tracks in their neighbourhood. Then you might have them draw pictures of the tracks they found and see if their classmates can guess what things made the tracks.

## A Second Look

1. What are two ways in which something may move?
2. How can something be moving and not moving at the same time?
3. How might tracks be helpful to you?



**Sample answers for "A Second Look":** 1. Something may move in either a straight line or a curved line. 2. A person riding in a car can be moving and not moving at the same time because that person is sitting still in a seat while the car is moving the person from one location to another. 3. Tracks might be helpful to me in finding someone or something.

# 3 What makes it move?

Each day you see many things around you move. Whenever something moves, it moves because of a *force*. A force is a push or a pull. A force is needed to make a train's wheels move around and around. A force is needed to make a ball move through the air. A force is needed to make a leaf fall from a tree. Where might the force to make each of these things move come from? [1]

[1] **Sample answer:** A train's wheels move because of a machine. A ball moves because of someone's muscles. A leaf falls because of gravity.



**Main concepts of the chapter (pages 174–181):**
Whenever something moves, it moves because of a force.
Force can come from muscles, machines, gravity, or magnets.
**Performance objectives:** After studying the information provided in this chapter, the children should be able to
—state why things move;
—list two different things force can come from.
**Important words:** force, muscles, machines, gravity, magnet.

## A force from you

Think about running, jumping, or throwing a ball. Whenever you do these things, you are moving parts of your body. When you move any part of your body, you are using a force. That force is coming from your *muscles* [MUHS-uhlz]. What muscles do you think the girl pictured on page 174 is using? [1]

Look at the picture at the right. Put your hand on your arm just like the boy in the picture is doing. Bend your arm toward you. Where is the force to move your arm coming from? Name some other times when you use the force from your arm muscle. [2]

How are the children in the picture below using force from their muscles? Which muscles are they using? Which side do you think will win? Why? [3]

[1] **Sample answer:** She is using her leg muscles.

[2] **Sample answer:** The force to use my arm comes from my arm muscle. I use this force to throw a ball and to carry things.

[3] **Sample answers:** The children are using their leg and arm muscles to play tug-of-war. I think the side on the left will win because there are more people on that side.

## Help from machines

Forces which move things may also come from *machines*. The machines you see in these pictures are being used to move things. Why is each machine able to move something?[1] What are some other machines that are used to move things?[2]

[1] **Sample answer:** Because the machines have engines to push, pull, or lift things.

[2] **Sample answer:** Elevators and train engines.



**Suggested activity and discussion:** After discussing "Help from machines," you may wish to have the children write down the names of all the machines they can find around their home that help move things.

## Down it goes

Think back to the first time you were on roller skates. Or the first time you rode a bike. Did you fall a few times? If so, you fell because of a force called *gravity* [GRAV-uht-ee]. Gravity is a force that pulls everything toward the earth. Wherever you are right now, gravity is pulling on you. What do you think would happen if there were no gravity on the earth? [1]

[1] **Sample answer:** Everything would float in the air.


## FINDING OUT

**How can you measure the force of gravity on different things?**

*You will need: scale (such as a bathroom scale or a spring scale), 3 or 4 heavy things such as books or rocks*

- Weigh each thing with the scale. Write down the weight of each thing. (The weight shows how much the force of gravity is pulling on each thing.)
- Guess the weight of some other things around you. Weigh them.

*How close were your guesses?*
*When might you need to know just how much something weighs?*



**Suggested discussion:** After discussing "Down it goes," you may wish to ask the children this question related to gravity: When astronauts travel in space, they are often shown floating about inside their spaceship. Why do you think they float about inside their spaceship? (Sample answer: When the astronauts are traveling in space, they float about inside their spaceship because there is no gravity. Therefore, there is no force pulling down on their body.)

**Teaching helps for "Finding Out":**
*Processes used:* observing, measuring, communicating, predicting.
*Sample findings:* The children will most likely make some guesses which are close and some which are not as close. The children might say that they would need to know just how much something weighs if they had only a certain amount of money to buy something sold by the kilogram.

The children in the picture on this page are having fun with their sleds. They just rode down the hill. If they want to get back to the top of the hill they must walk up and pull their sleds. To get up the hill, they must pull harder than the earth's gravity is pulling down on them and their sleds.

When they get to the top of the hill, they will get on their sleds and ride down again. Gravity will pull them down. When have you used the earth's gravity to move something?[1]

[1] **Sample answer:** When I have coasted downhill on a bike.



**Suggested discussion:** After discussing "Down it goes," you may wish to ask the children the following question: When would gravity have to be overcome in order to move something? (Sample answer: When an airplane takes off, when you lift something, or when you fly a kite.)

## Using magnets

Have you ever seen or used a *magnet* [MAG-nuht]? If so, you may know that force from a magnet can move things.

Look at the picture on this page. Which of the things in the picture will the magnet move? Why?[1] What are some other things a magnet can move?[2] Get a magnet. Try moving some things with your magnet.

### Exploring on Your Own

Though something may move because of a force, it may also slow down or stop moving because of a force. One such force is called *friction*. Find out what causes friction. You may want to use reference books to help you. Name some times when friction may slow something down or stop it from moving.

[1] **Sample answers:** Razor blade, nails, screws, pins, paper clips, tacks, key. Because they are metal.

[2] **Sample answer:** Needles, pots, pans.



**Sample findings for "Exploring on Your Own":** Friction is caused by two things rubbing against each other. Friction between the tires of a bike and the street will cause the bike to slow down if you do not keep pedaling. Friction between a boat and the water will cause the boat to slow down if you do not keep rowing.

## What force is it?

As you may know, forces move many things. Look at the picture below. What things do you think are moving? What force do you think is making each of them move?[1]


[1] **Sample answers:** Muscles are causing the boy's bike to move, the ball to travel through the air, the dog to run, and the mop to shake. An engine is causing the car to move. Gravity is causing the books and the dirt from the mop to fall. Wind is causing the leaves and the paper to move.

## FINDING OUT

**What are some other forces that can move things?**

*You will need: 2 marbles, table*

- Place one of the marbles in the middle of the table.
- Try to blow the marble off the end of the table.

*What force did you use to make the marble move?*

- Put the marble back in the middle of the table.
- Roll the other marble so it hits this marble.

*Where did the force that moved the marble in the middle of the table come from?*
*Name some other times when a moving object will make something else move.*

### *A Second Look*

1. What is a force?
2. Where does the force that helps you lift a book come from?
3. What is gravity, and what does it do?



**Teaching helps for "Finding Out":**
*Processes used:* observing, communicating.
*Sample findings:* The children will most likely say that they used their breath to make the marble move. After the children have rolled the one marble into the other, they will most likely say that the force came from the moving marble. The children may say that hitting a ball with a bat will make the ball move and hitting bowling pins with a bowling ball will make the pins move.
**Sample answers for "A Second Look":** 1. A force is a push or a pull that can cause things to move. 2. The force that helps me lift a book comes from the muscles in my arm. 3. Gravity is a force that pulls everything toward the earth.

## Workers Who Use Science

Every day you do things that have to do with location, motion, and force. You may move something from one place to another. You may take a ride across town. There are some workers who must know many things about location, motion, and force. *Airplane pilots* are such workers.

Airplane pilots must know how to find the location of many places when they are flying an airplane. To do this, they use special maps. Pilots must make sure that the airplane is moving along the right path. To do this, they must know how to use a radio. They must also know how to guide the airplane through strong wind forces.

To find out more about airplane pilots, try to find answers to these questions:

What is radar, and how is it helpful to pilots? [1]
What are some other things pilots use to help them find the location of places? [2]
What other forces must pilots know about? [3]

Along with sources of your own, writing to the following source may help you: Air Transport Association of Canada, 701-116 Albert Street, Ottawa, Ontario K1P 5G3

*This airplane pilot is checking many things in the airplane before takeoff. What might some of these things be?*



**Sample answer for the caption:** Weather instruments and maps.

**Sample answers for "Workers Who Use Science":**
[1] Radar is special radio waves which help pilots avoid planes and mountains and find airports when flying at night or in bad weather.
[2] Pilots may use a compass to locate places. They may also use certain reference objects such as large landmarks and stars.
[3] Pilots must know about the forces of gravity, machines, and magnets.

## Reviewing the Main Ideas

The place where you are at any time is your location.
Reference objects are used to help tell about the location of something.
There are times when it is important to know just how near or how far something is from you.
When something is in motion, it may move in a straight line. Or, it may move in a curved line.
Things will not move unless something starts them moving. And things will keep moving unless something stops them.
You can find out about the way some things move by looking at their tracks.
Whenever something moves, it moves because of a force.
Force can come from muscles, machines, gravity, or magnets.

## Reading About Science


Bendick, Jeanne. *Why Things Work: A Book About Energy.* Scarborough, Ontario: McGraw-Hill Ryerson Limited, 1972.

Bradley, Franklyn. *Gravity Is a Mystery.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1970.

McInnes, John and Murray, William. *Test Pilot.* Don Mills, Ontario: Thomas Nelson & Sons (Canada) Ltd., 1975.

Simon, Seymour. *Everything Moves.* Don Mills, Ontario: Fitzhenry and Whiteside Ltd., 1976.




**Reviewing the unit:** You may wish to have the children study "Reviewing the Main Ideas" to help prepare for "Testing for Understanding" on page 184.

**For further reading:** You may wish to encourage the children to read the books listed under "Reading About Science" and other books and articles related to the topic of location, motion, and force. Such articles might be found in reference books under the headings *motion, tracking, force,* and *gravity.*

# Testing for Understanding

**Ideas to Check**

On your paper write *T* for each sentence below that is true. Write *F* for each sentence that is false.

T 1. Reference objects are often used to help tell about the location of something.
T 2. *Near* and *far* are words that help tell about the location of something.
F 3. All things move in a straight line.
T 4. Many animals show tracks.
T 5. When you move any part of your body, you are using a force.
T 6. Things will not move unless something starts them moving.

Write on your paper the word that best fits in each blank below. Choose from these words: *map, motion, gravity, location, earth, force, machine, tracks.*

1. The ____ is always moving around the sun.
2. The force from a ____ can move things.
3. A ____ can be used to help find the location of something.
4. A ____ is a push or a pull.
5. Where you are right now is your ____.
6. The marks that things may leave when they move are known as ____.

**Words to Use**

earth
machine
map
force
location
tracks



**Suggestions for evaluation:** You may wish to use the test questions provided under "Testing for Understanding" to evaluate the children's understanding of the main ideas and important words of this unit. Additional test questions for the unit "Location, Motion, and Force" are provided for you on page T21 of the Teacher's Manual. These test questions may be duplicated for classroom use. Answers to these additional questions can be found on page T22 of the Teacher's Manual.

# Having Fun with Science

**What Am I?**

1. I will be anywhere you happen to be.
2. I never stop moving. And you move along with me.

**Fun with Words**

Think of a word that means location.
It sounds like *race* and *face.*

place

Think of a word that means moving.
It sounds like *lotion* and *potion.*

motion

Think of a word that means a push or a pull.
It sounds like *horse* and *course.*

force

**Mystery Games**

1. Play a mystery game with a group of people. Have someone go out of the room. Have someone else point to an object in the room. Have the first person come back into the room and guess the mystery object. This person must use reference objects to guess the mystery object. This person might ask, "Is it on *top* of the *table?* Or *behind* the *door?*"

2. Get some clay. Press it out like a pancake. Make some tracks in the clay with something such as a fork. Have other people try to guess what you used to make the tracks.



**For further involvement:** You may wish to use "Having Fun with Science" to involve the children in fun activities which reinforce some of the main concepts of the unit "Location, Motion, and Force." You may also wish to encourage the children to make up additional activities related to location, motion, and force.

**Answers for "What Am I?":** 1. My location. 2. The earth.

# Glossary-Index

One of the purposes of this glossary-index is to help you pronounce and understand certain words in this book. Another purpose is to help you find out about topics in this book that may interest you. You can find out about a topic by turning to the page or pages given at the end of each topic that is listed.

In this glossary-index, the syllables of a word are separated by a space. This can help you say the word. A special spelling may follow a word. This spelling always appears in [ ]. This spelling can also help you say the word. When a word has two or more syllables, one syllable is stressed more than others. This syllable is always spelled with large capital letters, as in the word *gravity* [GRAV-uht-ee]. Syllables that are not stressed are always spelled with small letters. Sometimes a word has one or more syllables that are stressed, but not so much as the syllable spelled with large capital letters. Those syllables are spelled with small capital letters, as in the word *electricity* [ih-LEHK-TRIHS-uht-ee]. Words of only one syllable are also spelled with small capital letters, as in the word *nerve* [NURV].

Sometimes a syllable in a special spelling is placed inside ( ), as in the word *mineral* [MIHN(-uh)-ruhl]. This means that some people say the syllable when they say the word, but some people do not.

Below is a list of the letters and letter groups used for the special spellings. Across from each letter or letter group, you can read how most people say the letter or letter group.

| Letter or letter group | Say like |
|---|---|
| a | *a* in *hat* [HAT] |
| ah | *a* in *father* [FAHTH-ur] |
| aw | *a* in *all* [AWL] |
| ay | *a* in *face* [FAYS] |
| ch | *ch* in *child* [CHYLD] and in *much* [MUHCH] |
| ee | *e* in *equal* [EE-kwuhl] |
| eh | *e* in *let* [LEHT] |
| eye | the first *i* in *iris* [EYE-ruhs] |
| g | *g* in *go* [GOH] |
| ih | *i* in *hit* [HIHT] |
| o | *o* in *hot* [HOT] |
| oh | *o* in *open* [OH-puhn] |
| oo | *oo* in *food* [FOOD] and *u* in *rule* [ROOL] |
| ow | *ou* in *out* [OWT] |
| oy | *oi* in *voice* [VOYS] |
| s | *s* in *say* [SAY] |
| sh | *sh* in *she* [SHEE] |
| u | *u* in *put* [PUT] and *oo* in *foot* [FUT] |
| uh | *u* in *cup* [KUHP] |
| ur | *er* in *term* [TURM] and *ir* in *sir* [SUR] |
| y | *i* in *nice* [NYS] |
| z | *s* in *degrees* [dih-GREEZ] |
| zh | *s* in *treasure* [TREHZH-ur] |

*(Acknowledgments continued from page 2)*

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TEACHER'S MANUAL FOR

# Exploring Science

BLUE BOOK


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# Contents



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# Introduction to
# THE LAIDLAW EXPLORING SCIENCE PROGRAM

## Objectives of the program

THE LAIDLAW EXPLORING SCIENCE PROGRAM has been designed and developed to provide pupils with relevant, effective learning experiences in both the knowledge and processes of science. These learning experiences are presented in such a way that all teachers can be effective teachers of science. To help you and your pupils reach these goals, the authors and editors have selected the following objectives for the program:

- to provide an exciting study of science by appealing to pupil interest and curiosity;
- to develop up-to-date science concepts and understandings that are meaningful in the lives of pupils;
- to provide ample opportunities for pupils to explore science through easy-to-do, "hands-on" activities utilizing familiar situations and simple, everyday materials;
- to help pupils become skillful in using the processes of science;
- to integrate skills and concepts of the biological, physical, and earth-space science areas as well as skills and concepts of other disciplines;
- to provide a basis for the development of positive values and attitudes toward science in people's everyday lives;
- to help pupils gain an awareness of the importance of their environment and its protection;
- to develop an awareness of career opportunities in science.

The following objectives reflect the concerns of teachers as to differences among pupils, cost and availability of materials, preparation time, and knowledge of science:

- to provide effective learning experiences for pupils with different interests and abilities;
- to utilize inexpensive materials that are common to the home or classroom for activities;
- to require preparation time and a background in science that are realistic for most elementary teachers.

## Rationale and approach

A considerable part of the pupils' everyday life involves science in one way or another. Using this rationale, the authors and editors have approached science through situations and materials that are familiar to the pupils. Because of this approach, THE LAIDLAW EXPLORING SCIENCE PROGRAM relates to the everyday life of the pupils. The following characteristics of the program reflect this general rationale and approach:

***Activity oriented.*** Each level of the program incorporates a "hands-on" approach using familiar, everyday materials in easy-to-do activities. In this way the pupils explore, discover, or verify concepts and ideas about objects and events. The illustrations and text material support and guide the pupils in performing and interpreting these activities.

***Integrated science.*** The program integrates the skills and concepts of the biological sciences, physical sciences, and earth-space sciences. Because the program approaches science as part of the pupils' everyday life, multidisciplinary relationships occur naturally. Skills and concepts related to health, safety, math, music, history, art, language arts, geography, and other disciplines are integrated with science throughout the program. As a result, the pupils begin to look at the world in fresh, new ways.

*Informal, highly visual style.* The Laidlaw Exploring Science Program stimulates and maintains pupil interest through a direct, informal writing style and the use of full-color illustrations. The photographs and drawings have been selected not only for visual appeal but also to help explain, clarify, and provide greater insight. The informal writing style and full-color illustrations help create a program with which the teacher and pupils feel comfortable.

*Use of humor.* Another integral part of the rationale and approach is that a science program can be fun. Humor is effectively used to create interest and to involve pupils. For example, a cartoon based on an amusing incident is used to help introduce each unit. Humor is occasionally used to develop a concept within a unit, also.

*Widening experiences.* As brought out, The Laidlaw Exploring Science Program consists primarily of science which is part of the pupils' everyday life. However, the program also takes the pupils beyond this point. This is done by including certain science topics that are significant but may not be of an everyday nature. Many illustrations also serve to widen the scope of the pupils' science experiences. Because of these aspects of the program, the pupils are stimulated and aided in exploring the unknown and unusual.

## Organization and content

The authors and editors have carefully structured the books to provide a consistent, functional organization which enhances effective teaching and learning. Timely and important content areas, such as the environment and its protection, are included in each book.

*Units.* There are six units in each book of The Laidlaw Exploring Science Program. Each unit explores a different topic of interest and importance to pupils. Balanced coverage of the life sciences, the physical sciences, and the earth-space sciences is maintained by having two units devoted to each of these three areas in each book. This carefully balanced content enables pupils to study the major areas of science every year. As pupils grow and mature from year to year, the content changes accordingly, taking into account the pupils' abilities, understandings, experiences, interests, and reading level.

The units can be studied in any order. Each unit is a self-contained teaching and learning unit. This adds a dimension of flexibility to the use of the program.

*Chapters and chapter sections.* Each unit is divided into chapters. The chapters aid in comprehension by breaking the unit topic into smaller teaching and learning packages.

The content of each chapter is organized by sections. The sections help outline the chapter content, further enhancing understanding of the chapters.

## Processes of science

Inherent in any type of learning experience —whether it is in science, health, math, or any other area—are certain processes of learning. In science, these processes are sometimes referred to as inquiry skills.

The Laidlaw Exploring Science Program provides many opportunities for pupils to develop skill in using the processes of science. These opportunities are presented throughout the text, illustrations, and special features of the program, especially each of the "Finding Out" activities.

For ease of identification and reference, a list of these processes, or inquiry skills, and a description of each have been included on the next page.

***Observing.*** Using the senses—seeing, tasting, touching, hearing, and smelling—to find out about objects or events in the environment

***Comparing.*** Recognizing ways in which objects or events are alike or are different

***Classifying.*** Grouping objects or events according to their observed characteristics

***Measuring.*** Finding out about an unknown quantity by comparing it with a known quantity

***Using numbers.*** Applying the operations of counting and measuring to objects or events under observation or study

***Using spatial relationships.*** Perceiving and describing objects in terms of their shape, motion, position, or location

***Communicating.*** Conveying information by means of oral or written descriptions, pictures, graphs, charts, maps, demonstrations, etc.

***Collecting data.*** Combining as many processes as necessary to obtain information about objects or events

***Inferring.*** Figuring out a conclusion based on observations of an object or event

***Interpreting data.*** Explaining the meaning or the significance of information regarding an object or event

***Predicting.*** Describing in advance the outcome of an event or process based on observations or data

***Hypothesizing.*** Arriving at general statements of concepts from observations and data

***Experimenting.*** Designing and carrying out procedures to obtain reliable information about interrelationships between objects and events

**Role of the teacher**

For as many teachers of science that exist, there are at least the same number of science teaching methods. A method that works for one teacher may not work for another. Therefore, to be effective, each teacher must develop his or her own method of teaching science. The pupils' text and the Teacher's Edition have been designed to support and assist you in teaching and in developing a method of teaching science which is effective and enjoyable. Some of the general ideas that follow may also be of help to you.

***Inquiry techniques.*** When teaching science, there has been a tendency for some teachers to feel that their role was mainly to dispense knowledge and answer questions. As a result, the teachers—rather than the students—did most of the work. It is often more effective for teachers to take on a different role, one in which they facilitate pupil inquiry.

To facilitate pupil inquiry, it is important for you to create an atmosphere of exploring, investigating, and finding out. To do this, you might pose interesting objects or problems for your pupils to investigate. During investigations, you might ask key questions now and then to stimulate investigation. You might also encourage your pupils to ask questions and have them try to find answers to their questions. You and your pupils may find that some questions have many answers and that others have no answers at all! These things will help keep your science lessons interesting and open-ended.

***Flexibility.*** Another idea which may be helpful to you in developing an effective science teaching method is to try to remain flexible. For example, you may wish to follow the sequence of units as they appear in the program. Or, you may wish to vary the sequence according to the seasons to capitalize on pupil interest or availability of materials.

In addition to using the unit-opening cartoon to introduce a unit, you may want to make use

of an interesting demonstration or bulletin-board display. Another area in which being flexible is often important is the degree to which your science lessons are activity oriented. It is reasonable that you may want to make use of many activities for some lessons, but mainly use the text and illustrations for others.

To help enrich the concepts and activities in a unit, you may want to make use of community resources such as museums, factories, or parks. The possibilities are endless!

***Intuition as well as logic.*** Another important point to keep in mind is that it is equally important for pupils to develop intuitive thought processes as well as logical thought processes. Intuitive thought processes are those processes that involve calculated guesses, hunches, and ideas such as "What would happen if I tried this?"

Most scientists agree that after all calculations have been made and all logical ideas have been pursued, it is often an intuitive process that brings the final solution to a problem. Pupils sometimes need a chance to manipulate or "play" with an object or a problem with no specific or immediate goal in mind. Pupils will often intuitively come up with questions, ideas, or solutions of their own. Through these experiences, they may begin to gain an awareness and appreciation of the aesthetics—the sheer beauty —in science.

## Features of THE LAIDLAW EXPLORING SCIENCE PROGRAM

### Basic features

The features of THE LAIDLAW EXPLORING SCIENCE PROGRAM have been developed and designed to excite pupils about science by providing high interest, visual appeal, involvement, relevancy, and success for pupils. These features can be categorized as basic features which permeate the entire program or as special features designed primarily for organizing and emphasizing content and activities. This section describes the basic features of the program.

***Illustrations and format.*** Perhaps the most obvious features of the program are the colorful illustrations and the open, uncluttered format. These two visual features create an attractive, appealing invitation to study science.

The illustrations are not only an important source for interest and appeal but they are also valuable aids to learning. Each illustration has been carefully selected for the purpose of helping to explain, clarify, add new meanings, or provide greater insight.

Many of the captions for the illustrations are in the form of inductive questions that further involve pupils in the content and in the processes of science. The many illustrations which depict children in familiar situations help pupils recognize that science is a part of their everyday life.

***"You" approach.*** To further the pupils' feeling of involvement, the text has been written using the "you" approach. The authors and editors have written the text as if they were speaking directly to each pupil.

***In-text questions.*** Not only does the text involve the pupils personally, but it also elicits responses from them by means of frequent questions. Most of the questions are inductive questions. They help the pupils relate their experiences and the

ideas presented in the text to the total concept being developed. Some of the questions involve the pupils' opinions or feelings.

*Vocabulary.* The use of unfamiliar words has been kept to a minimum. However, if a word important to the understanding of a concept is unfamiliar, the word is *italicized* for emphasis and defined in the text. These words are usually followed by a phonetic respelling to aid in pronunciation and understanding.

*Readability.* To help ensure ease of reading, the vocabulary and sentence length in each book of the program has been controlled according to the formula that was applicable, either "The Spache Readability Formula" or the Dale-Chall "A Formula for Predicting Readability." Furthermore, extra space has been inserted between words to help ensure ease of reading.

The special consideration given the program's readability to ensure pupil success and interest is further emphasized by these previously mentioned basic features:

- a clear, direct writing style;
- illustrations that help pupils visualize topics and concepts;
- an open, pleasing format;
- a "you" approach that makes use of pupils' experiences;
- in-text questions to involve pupils;
- in-text definitions and phonetic respellings of new or difficult words.

***Metric measurements*** (S1) are used throughout the program. Metric symbols and terminology are based on the *Metric Style Guide* and the *Metric Practice Guide.*

**Special features**

A variety of interesting and effective special features appear throughout the program. These special features are designed to help organize and present the content and activities of the program.

***Unit introduction.*** A colorful, two-page introduction for each unit is designed to stimulate pupil interest and to focus on the topic of the unit.

The first page contains the unit title, chapter titles, and a colorful illustration. The illustration is made from three-dimensional artwork and carries the theme of the unit.

The second page contains an imaginative, full-color cartoon. The cartoon is followed by questions which help focus attention on the unit topic.

***Chapter introduction.*** Each chapter begins with a brief written introduction. The introduction helps the pupils focus on the chapter topic and helps relate the chapter topic to the pupils' own experiences. Most of the written introductions are accompanied by a color illustration.

***Descriptive headings.*** For ease of understanding, descriptive headings and subheadings are used to organize the text. The headings and subheadings appear in heavier type than the text. Many of them are written as questions or catchy phrases to add interest to the text. Also, the headings and subheadings enhance understanding and interest by dividing the text into smaller "thought packages."

***"Finding Out."*** In THE LAIDLAW EXPLORING SCIENCE PROGRAM an activity feature, titled "Finding Out," occurs frequently throughout each book. Each of these activities provides opportunities for pupils to gain "hands-on" experiences and to use the processes of science. The concepts developed in the text are enhanced and extended through these activities.

Each "Finding Out" begins with a question that correlates the activity with a concept in the text. Next, the materials needed for the activity are listed. These consist of simple, inex-

pensive materials commonly found in the school or home. The simple setup is clearly illustrated and the steps for carrying out the activity are clearly and simply stated. The activity also includes questions which ask the pupils to explain their findings or relate their findings to the concept being developed. Many times, suggestions which open end the activity are also given.

A few dimensions of flexibility in this feature are of particular note. Each "Finding Out" activity has been designed so that it can be carried out by individual pupils, by small groups, or by the entire class. Substitutes for materials listed in the activity can often be used. For example, the pupils may want to use glass jars instead of milk cartons if they are more readily available or if the pupils think they will give better results. Even some of the steps can be altered to fit the situation or the interests of the pupils.

"***For You to Think About.***" This feature appears in the side margin. It poses one or more questions which are designed to elicit the pupils' opinions or feelings about something developed in the text. Or, the pupils may be asked to make an inference, interpret data, or formulate a hypothesis regarding something developed in the text.

"***Exploring on Your Own.***" The text often touches on many ideas that could be pursued beyond the intended scope of a unit. This special feature encourages pupils to pursue these ideas through their own research.

This feature appears in the side margin and contains a statement or two explaining a possible idea for research in connection with the corresponding text. This feature may also contain suggestions on how to carry out the research, such as doing in-depth work at the library, talking with people who use science in their jobs, or doing simple outside investigations.

"***A Second Look.***" Each chapter ends with a short list of review questions. This feature, titled "A Second Look," enables the pupils to check their understanding of the important facts and concepts of the chapter before continuing on to the next chapter.

"***Workers Who Use Science.***" As part of the concern for the total development of the pupils, the authors and editors have incorporated this career-oriented feature into the program. This feature appears at the end of each unit and relates and applies the main concepts of a unit to a particular field of work. This feature also describes how the work of people in this field is important to other people.

"Workers Who Use Science" contains a full-color photograph of a particular worker in action. It also includes questions about the worker and possible sources for finding answers to these questions.

The main purpose of this feature is to help create in pupils an awareness of possible career opportunities in their future. Careers which require a minimum of training are described as well as those that require college degrees.

"***Reviewing the Main Ideas.***" The end of each unit also contains a list of the main ideas of the unit. This list provides the teacher and pupils with a handy tool for reviewing the main concepts developed in the unit.

"***Reading About Science.***" The next feature at the end of each unit is a bibliography for the pupils. Suggestions are given for further reading about topics in the unit. The bibliography at each level offers reading materials appropriate for the age, grade level, and interests of the pupils.

"***Testing for Understanding.***" This feature of the program provides a quick way of checking the pupils' understanding of the important ideas and words of the unit. The first part of the feature, subtitled "Ideas to Check," contains a list of statements for the pupils to designate as either true or false. The second part of the feature, subtitled "Words to Use," contains a list of

incomplete statements. The pupils are asked to complete the statements using the appropriate word or words from a list of choices given.

"*Having Fun with Science.*" This feature appears on the last page of every unit. It provides opportunities for the pupils to reinforce and extend some of the concepts of the unit by means of fun-type activities. The activities are easy to carry out and appear under many different subtitles, such as "Brainteasers," "What Am I?" "Fun with Words," and "Things to Do."

"*Glossary-Index.*" A combined glossary and index is provided at the end of each book. The purposes of the "Glossary-Index" are to help the pupils pronounce and understand certain words in the book and to help the pupils find out about topics in the book that may interest them. The "Glossary-Index" also contains an explanation of the phonetic respelling system used in the book.

For ease of identification, the words which are listed in the "Glossary-Index" appear in boldface type. The page numbers on which the words appear are also included. Cross-references are given when considered beneficial.

## Teacher's Edition for THE LAIDLAW EXPLORING SCIENCE PROGRAM

### Purpose and physical features of the Teacher's Edition

The purpose of the Teacher's Edition for THE LAIDLAW EXPLORING SCIENCE PROGRAM is to provide you, the teacher, with a variety of teaching aids which you can use conveniently and efficiently. The Teacher's Edition has been designed to help you guide your pupils in developing science concepts with ease and confidence.

The Teacher's Edition consists of full-color reproductions of each page from the pupils' text with extended bottom margins followed by a twenty-four page Teacher's Manual. The printed copy and illustrations from the pupils' text appear in the same size in the Teacher's Edition as in the pupils' text to help ensure ease of reading.

The inclusion of the pupils' pages makes it possible to easily point out something on the page for your pupils. The extended bottom margins make it possible to have a variety of specific teaching helps immediately available on the lesson page. Teaching helps which appear on the reproduced pupils' pages are printed in blue for easy identification. The Teacher's Manual contains information to help you understand and use all the components of the program effectively.

The sturdy wire binding of the book allows you to handle and use the Teacher's Edition easily and conveniently.

### The Teacher's Manual

The twenty-four pages which follow the reproduced pupils' text are referred to as the Teacher's Manual. The Teacher's Manual contains information to help you understand and effectively use THE LAIDLAW EXPLORING SCIENCE PROGRAM. The Teacher's Manual consists of the sections that follow.

*Introduction to* **THE LAIDLAW EXPLORING SCIENCE PROGRAM.** The objectives and approach of the program are presented with related science and science-teaching background information. Organization and content are also discussed.

*Features of* THE LAIDLAW EXPLORING SCIENCE PROGRAM. The features of the program are described, and the function of each feature is explained.

*Teacher's Edition for* THE LAIDLAW EXPLORING SCIENCE PROGRAM. Each feature of the Teacher's Edition is described. Suggestions as to how you can use each feature in teaching are explained.

*Instructional Materials.* This section consists of an annotated bibliography of instructional materials. The listing includes printed materials, films, and recorded materials. These instructional materials are categorized as general references or as materials appropriate for a particular unit.

*Unit Tests.* Suggested tests for each unit are provided in this section.

*Answers for Unit Tests.* Answers or sample answers for the Unit Test questions are listed in this section.

### Features appearing in the extended bottom margins

A wide variety of teaching helps are conveniently located in the extended bottom margins of the Teacher's Edition.

*Preparing for the unit.* This feature appears on the first page of each unit. It contains page references for books, films, and recorded materials listed in the "Instructional Materials" section of the Teacher's Manual that are appropriate for use with the unit.

A list of the page reference for each "Finding Out" activity in the unit is also included. This provides an opportunity to have your pupils collect, in advance, the materials needed for each activity.

*Introducing the unit.* The second page of each unit contains suggestions for using the unit-opening cartoon and questions to help introduce the unit to your pupils.

*Main concepts of the chapter.* The main concepts of each chapter are concisely summarized on the first page of each chapter. This helps you see at a glance the main ideas to emphasize in teaching the chapter.

*Performance objectives.* Also appearing on the first page of each chapter is a list of performance objectives. The objectives state in behavioral terms the main things your pupils should be able to do after they have completed the learning experiences provided in the chapter. The objectives are simply stated and can be used to help establish cognitive goals with your pupils.

*Important words.* The important words of each chapter are also listed on the first page of each chapter. You may wish to use this list to emphasize certain words that are important in understanding the main concepts of the chapter and in strengthening science vocabulary.

*Suggested activity, discussion, or research.* Very often throughout a unit, suggestions for enriching a section of the pupils' text are given. These suggestions may be ideas for a simple activity, a thought-provoking discussion, or interesting research. Sometimes, a combination of suggestions is given, such as "Suggested activity and discussion" or "Suggested discussion and research."

*Teaching helps for "Finding Out."* This feature appears on each page that has a "Finding Out" activity. The teaching helps are divided into sections. The first section, titled "Processes used," contains a list of the science processes that your pupils will develop and utilize during the activity. A list of these processes and their description appears on page T5 of the Teacher's Manual.

Another section, "Sample findings," describes what your pupils may find out while doing the activity. Of course, your pupils' findings may go far beyond those given. However, being aware

of some of the possible findings in advance can help you in guiding the pupils in their activity and discussion.

The two sections described above appear in each of the "Teaching helps for Finding Out." Two other sections which sometimes appear in this feature are "Additional information" and "Extending the Finding Out." "Additional information" may provide helpful hints for carrying out the activity. Or, it may provide background information helpful in explaining the findings. "Extending the Finding Out" contains suggestions for expanding the "Finding Out" or carrying out another activity related to the "Finding Out."

***Teaching helps for pictures.*** The illustrations throughout each chapter are designed to help develop the concepts of the chapter. On many of the pages, specific teaching helps for using a picture are given.

***Sample answers for various features.*** Many of the features of the program, such as "For You to Think About," are designed to elicit responses from the pupils. Of course, your pupils' responses may vary, and in many instances there are no right or wrong answers. The purposes of listing sample answers are to alert you to the kinds of answers your pupils are likely to give and to help you in guiding the discussion of the various features.

Sample answers for the following features appear in the bottom margins: questions below the unit-opening cartoon, "For You to Think About," captions for illustrations, "A Second Look," and "Workers Who Use Science." Answers for various sections of "Having Fun with Science" are given when called for.

***Sample findings for "Exploring on Your Own."*** Also included in the bottom margins are sample findings that your pupils will most likely discover when they carry out research in the feature "Exploring on Your Own." The sample findings are designed to help you verify the pupils' findings without performing the research yourself.

***Reviewing the unit.*** This feature appears on the first color-tinted page at the end of each unit. It encourages you to have your pupils study the list of main ideas of the unit on that page in order to review the unit and prepare for "Testing for Understanding."

***For further reading.*** This feature also appears on the first color-tinted page at the end of each unit. It gives suggestions for encouraging your pupils to use the bibliography on that page to further explore various aspects of the unit topic.

***Suggestions for evaluation.*** This feature appears on the same page as "Testing for Understanding" at the end of each unit. It contains suggestions for utilizing the test questions on that page for evaluating your pupils' progress. It also tells you where in the Teacher's Manual additional test questions (and their answers) for the unit can be found.

***For further involvement.*** This feature appears on the last page of each unit. It offers suggestions for encouraging your pupils to carry out the activities in "Having Fun with Science" on that page and other fun-type activities which help reinforce some of the concepts developed in the unit.

**Features appearing in the side margins**

The wide side margins of the pupils' page provide space to conveniently include the teaching helps that follow.

***Sample answers.*** Throughout the pupils' text are many questions for your pupils to think about and answer as they read the material. To help you keep a smooth flow of discussion in your classroom, sample answers to these questions are provided for you in the side margins as close to the questions as possible. Though there are often many possible answers to these questions,

the sample answers are intended to alert you to the kinds of answers that are acceptable and help you keep your pupils within the main theme of the material being developed.

The questions and their corresponding answers are marked by superscript numbers for ease of identification. In the few places where there is not enough space in the side margin for sample answers, they appear in the bottom margin.

***Answers for Testing for Understanding.*** The answers to the test questions at the end of each unit appear next to the questions. This makes it quick and easy for you to check your pupils' progress at the end of each unit.

## Instructional Materials

**General references**


Blough, Glen O., and Schwartz, Julius. *Elementary School Science and How to Teach It.* Toronto, Ontario: Holt, Rinehart and Winston, 1974. Up-to-date information in the different subject areas of science taught at the elementary level is provided in this book.

Fappler, George and Lisbeth. *Science in Summer and Fall.* Toronto, Ontario: Doubleday Canada, 1974.
This guide and resource book for teachers covers biological and earth-space sciences for seasonal studies.

Gega, Peter C. *Science in Elementary Education,* 3rd Edition. Rexdale, Ontario: John Wiley and Sons, 1977.
This book provides a comprehensive explanation of how to teach elementary science. Part I introduces science organization, strategies, evaluation, and lesson planning. Part II contains model lesson plans that encourage children to learn through the development of their own critical thinking skills.


**Unit 1 Seed Plants (pages 6-31)**

*Reference materials*


*Elementary Science Study: Growing Seeds* and *Life of Beans and Peas.* Scarborough, Ontario: McGraw-Hill Ryerson, 1976.
These guides present many activities that may be done with seeds and plants.

*Teaching Primary Science: Seeds and Seedlings.* Agincourt, Ontario: GLC Publishers, 1976.


*Filmed or recorded materials*


"How Plants Spread and Reproduce" and "Seeds Grow into Plants," filmstrips, with records or cassettes. Agincourt, Ontario: Cinemedia.

"Plant Experiments," filmstrip, 32 frames. Don Mills, Ontario: Educational Film Distributors.

"Plants and How They Grow," filmstrip, 58 frames, 13 minutes. Don Mills, Ontario: Educational Film Distributors.

"Plants We Know," filmstrip, 31 frames. Don Mills, Ontario: Educational Film Distributors.


**Unit 2 Animal Behaviour (pages 32—63)**

*Reference materials*


Allen, Thomas B., ed. *The Marvels of Animal Behavior.* Washington, DC U.S.A.: National Geographic Dept., 1972.
This work discusses the life-styles and

habits of a wide variety of animals. It includes animal societies, provision for the young, and communication between animals.

Burton, Maurice. *The Sixth Sense of Animals.* Don Mills, Ontario: Burns and MacEachern.

Animal studies in laboratories and in the wild are discussed in this book. Animals' biological clock, navigation, sense of touch, and unusual forms of behaviour are topics included.

*Elementary Science Study: Earthworms.* Scarborough, Ontario: McGraw-Hill Ryerson, 1971.

*Filmed or recorded materials*

*Animal Behaviour Series,* "Animal Behaviour: Fall," "Animal Behaviour: Winter," "Animal Behaviour: Spring," and "Animal Behaviour: Summer," films, 11 minutes each. Don Mills, Ontario: Educational Film Distributors.

"Finding Out How Animal Babies Grow," filmstrip, 26 frames. Don Mills, Ontario: Educational Film Distributors.

"Fine Feathers," film, 6 minutes. Toronto, Ontario: National Film Board.

"Migration of Birds," filmstrip, 43 frames. Don Mills, Ontario: Educational Film Distributors.

*Why Animals Live Where They Live,* filmstrip series, set of 6, with records or cassettes. Mississauga, Ontario: Cenco Canada.

"The Zoo Keeper," film, 15 minutes. Toronto, Ontario: Visual Education Centre.

**Unit 3 Heat and Temperature (pages 64—95)**

*Reference materials*

*Elementary Science Study: Ice Cubes.* Scarborough, Ontario: McGraw-Hill Ryerson, 1975.

Wilson, Mitchell. *Energy.* Agincourt, Ontario: GLC Publishers, 1963.

One in the excellent *Life Science Library* series, this book discusses heat as an important kind of energy and tells of its relation to other kinds of energy.

*Filmed or recorded materials*

"Energetically Yours," film, 14 minutes. Toronto, Ontario: National Film Board.

"Heat Causes Expansion," film, 13 minutes. Don Mills, Ontario: Educational Film Distributors.

"Heat and How We Use It," film, 11 minutes. Toronto, Ontario: Visual Education Centre.

"Metric Measurement of Temperature and Mass," filmstrip, with record or cassette. Scarborough, Ontario: E.T.H.O.S.

**Unit 4 Sounds Around You (pages 96—127)**

*Reference materials*

Cosgrove, Margaret. *Messages and Voices—The Communication of Animals.* Toronto, Ontario: Dodd, Mead & Co., 1974.

This work studies the methods by which a large variety of animals are able to communicate.

*Elementary Science Study: Whistles and Strings* and *Musical Instruments Recipe Book.* Scarborough, Ontario: McGraw-Hill Ryerson, 1971.

These guides provide many activities that may be done with sound.

*Filmed or recorded materials*

"Finding Out About Sound," filmstrip, 37 frames. Don Mills, Ontario: Educational Film Distributors.

"Light, Heat and Sound," filmstrip, 31 frames. Don Mills, Ontario: Educational Film Distributors.

"Sound and How It Travels," film, 11 minutes. Toronto, Ontario: Visual Education Centre.

"Sounds We Hear," filmstrip, 32 frames. Don Mills, Ontario: Educational Film Distributors.

**Unit 5 Water in Your Environment (pages 128—159)**

*Reference materials*

Gordon, Bernard L. *Man and Sea/Classic Accounts of Marine Explorations.* Toronto, Ontario: Doubleday Canada, 1972.

This is a collection of over seventy articles of explorations of the seas. The articles range historically from Leonardo da Vinci to Jacques Cousteau and emphasize the importance of water study to all people.

*Teaching Primary Science: Science from Water Play.* Agincourt, Ontario: GLC Publishers, 1976.

This teacher resource book contains many practical ideas for classroom use.

*Filmed or recorded materials*

"It's Snow," film, 5 minutes. Toronto, Ontario: National Film Board.

"The Oceans," filmstrip, with record or cassette. Agincourt, Ontario: Cinemedia.

"Water and Its Importance," part of the filmstrip series *Science in Everday Life.* Mississauga, Ontario: Cenco Canada.

"What in the World is Water?" film, 12 minutes. Toronto, Ontario: National Film Board.

**Unit 6 Location, Motion, and Force (pages 160—185)**

*Reference materials*

Smith, Norman F. *Wings of Feathers, Wings of Flame: The Science and Technology of Aviation.* Toronto, Ontario: Little, Brown and Company, 1972.

This book contains readable explanations of how pilots navigate in the clouds. It also discusses the motions of planes and how air pressure helps them fly.

Tabor, David, and Bowden, F. P. *Friction: An Introduction to Tribology.* Toronto, Ontario: Doubleday Canada, 1973.

The topics explained in this book are the laws of friction and the nature of matter in motion. The discussion covers both the need for and the problems of friction.

Thrower, Norman J. W., and Andrews, W. *Maps and Man.* Scarborough, Ontario: Prentice-Hall of Canada, 1972.

This is a highly illustrated study of maps, their uses, and their relation to people around the world.

*Filmed or recorded materials*

*Investigations in Science: Energy and Motion,* "Acceleration" and "Inertia," filmstrip series, 34 frames each. Toronto, Ontario: Holt, Rinehart and Winston.

"Making Things Move," film, 11 minutes. Toronto, Ontario: Visual Education Centre.

# Unit Tests

### Purpose of the tests

Tests for each of the six units of this book are provided on the pages that follow. These tests are designed to assist you in evaluating your pupils' progress in learning and applying the important words and main concepts for each unit.

### Ways of testing

Depending on your teaching approach for each unit, you might choose to use these tests to evaluate your pupils in various ways. A unit test might be used as a pretest/posttest. That is, the test might be given to your pupils before they begin a unit. Then, you might wish to give the test again after the pupils have completed the unit. In this way, you may compare the results to help you in evaluating the pupils' progress.

You might wish to use these unit tests only as posttests. After the pupils have completed a unit, you may wish to give these tests in lieu of or in addition to "Testing for Understanding" found at the end of each unit in the pupils' text.

### Duplicating the tests

You are granted full permission to duplicate these tests for your classroom use. If duplicating machines are not available in your school, you are granted full permission to rewrite these tests in the form which can most easily be presented to your pupils.

### Test answers

Space has been provided for answers to be written on these tests. For any short-answer or essay-type items, your pupils may need extra space to write their complete answers. For such items, you might have the pupils use the reverse side of the test or an extra sheet of paper.

Answers to each unit test are provided on the Teacher's Manual pages immediately following the last unit test. Answers to the matching, sentence completion, and true-false questions are listed numerically with their letter answer.

Answers to the essay questions are presented in a short, concise form. Your pupils' answers to these questions will, of course, vary from the exact terminology of the sample answers. It is up to your discretion to weigh each of the pupils' answers and to judge their acceptability.

### Scoring the tests

Each unit test has a total score value of 100 points. The point value for each question is given with the directions for each part of the test. Some questions have a greater point value than others. By totaling the number of points for each section, you can determine the final score and record it in the space provided at the top of each test.

Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 1 Seed Plants

*(Textbook pages 6–31)*

Match the part of a seed plant with the job it does. Some parts may be used more than once. (10 points each)

_____ 1. The part which makes food
_____ 2. The part which takes water and minerals out of the ground
_____ 3. The part which carries water and minerals from the root to other parts of the plant
_____ 4. The part in which seeds are made
_____ 5. The part above the root which holds up other parts of the plant
_____ 6. The part which holds the plant in the ground

a. root
b. stem
c. leaf
d. flower

Read each story below. Write your answer below each story. If you need more space, write on the back of this sheet or on another sheet. (20 points each)

7. John has some tomato seeds he wants to grow, but is not sure what these seeds need. So John decides to ask you. What things would you tell John that his tomato seeds need in order to grow?

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8. Martha told you that she did not know why seed plants were important to her. What things could you tell Martha about seed plants which might show her that seed plants are important to everyone?

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Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 2 Animal Behaviour

*(Textbook pages 32–63)*

Below is a list of some things animals do. Mark those things which are instincts with an *I*. Mark those things which are learned with an *L*. (10 points each)

_____ 1. A bird building a nest
_____ 2. A lion hunting for food
_____ 3. A mother bird feeding some baby birds
_____ 4. A squirrel opening a nut

Write *T* for each sentence below that is true. Write *F* for each sentence below that is false. (10 points each)

_____ 5. Heat, light, and water make all animals behave in certain ways.
_____ 6. People can find out what animals like or do not like by watching how these animals behave.
_____ 7. Some animals are able to travel to a certain place they have never been to before because of instinct.
_____ 8. Some animals learn things by watching other animals.

Write your answer below each of the following questions. If you need more space, write on the back of this sheet or on another sheet. (10 points each)

9. List four different instincts animals may have.

---

10. List five ways in which animals may learn.

---

Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 3 Heat and Temperature

*(Textbook pages 64–95)*

Write *T* for each sentence below that is true. Write *F* for each sentence below that is false. (8 points each)

_____ 1. People can use heat from the earth to make electricity.
_____ 2. Because warm air moves down, the heat in most rooms comes from someplace near the ceiling.
_____ 3. Heat makes water in a pan boil; this shows that heat can move from one object to another.
_____ 4. A sidewalk takes up more room on a cold winter day than on a hot summer day.
_____ 5. The temperature of something tells you just how hot or how cold it is.

Write your answer below each of the following questions. If you need more space, write on the back of this sheet or on another sheet. (15 points each)

6. Name two ways in which heat can change things.

---

7. Tell why people sometimes want to keep heat from moving.

---

8. The earth is one thing heat comes from. Name four other things heat comes from.

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9. Tell why a thermometer is important to people.

---

Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 4 Sounds Around You

*(Textbook pages 96–127)*

Make the following sentence true by writing either *higher* or *lower* in each blank below. (10 points each)

1. A tightly stretched rubber band will make a _____ sound than a loosely stretched rubber band.

2. A large bell will make a _____ sound than a small bell.

3. Blowing across the top of an empty bottle will make a _____ sound than blowing across the top of a half-filled bottle.

4. Tightening your vocal cords when you talk makes your voice _____

_____ than loosening your vocal cords when you talk.

Write your answer below each of the following questions. If you need more space, write on the back of this sheet or on another sheet. (20 points each)

5. Name two ways sounds are different and one way they are alike.

---

6. Name two ways in which hearing with both ears helps you.

---

7. Pick one musical instrument. Tell how sounds are made with this instrument.

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Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 5 Water in Your Environment

*(Textbook pages 128–159)*

Underline the word or words in ( ) that best complete each of the following sentences. (8 points each)

1. Water that has wastes and germs in it is (safe; unsafe) to drink.
2. There is (a need; no need) for people to use water wisely.
3. Your body (uses; does not use) water to help keep cool.
4. Most fresh water comes from water that has evaporated from (lakes; oceans).
5. Most of the water on the earth is (salt; fresh) water.

Write the letter of the word from column *II* in front of the word it matches in column *I*. (8 points each)

| I | II |
|---|---|
| 6. _____ environment | a. unclean |
| 7. _____ water vapour | b. wells |
| 8. _____ salt water | c. oceans |
| 9. _____ polluted | d. surroundings |
| 10. _____ fresh water | e. gas |

Read the story below. Circle the letter of the choice you make. Tell why you made that choice. If you need more space, write on the back of this sheet or on another sheet. (20 points)

11. Ann and Joan were walking in a park by the side of a small stream. Both of them were very thirsty. Which one of these things should they do?

a. Drink some of the water from the stream
b. Taste the water, and if it tastes all right, drink some of it
c. Wait until they find a water fountain

Why? _____

Name _____ Score _____
*(100 points total)*

## Test Questions for Unit 6 Location, Motion, and Force

*(Textbook pages 160–185)*

Circle the letter of the answer you choose. (15 points each)

1. When a rock rolls down a hill, the rock moves because of a force from

a. gravity c. machines
b. muscles d. magnets

2. When you walk or run, you move because of a force from

a. gravity c. machines
b. muscles d. magnets

Write the word or words that best fit in each blank. Choose from these words: *curved, near, tracks, maps, straight, reference objects, far.* (10 points each)

3. When something is in motion, it moves in a _____

or a _____ line.

4. You can use words like _____ and _____ to help you tell someone your location.

5. You can sometimes find where an animal is by following its _____.

Write your answer below each of the following questions. If you need more space, write on the back of this sheet or on another sheet. (20 points each)

6. List two ways in which reference objects may be helpful to you.

---

7. Explain how something can be moving and not moving at the same time.

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# Answers for Unit Tests

**Unit 1 Seed Plants**

1. c 2. a 3. b 4. d 5. b 6. a
7. Air, water, warmth. After the seeds start to grow, they will also need soil and light.
8. Seed plants are important because they are beautiful, because they are used for food, and because they are used to make things people use.

**Unit 2 Animal Behaviour**

1. I 2. L 3. I 4. L
5. T 6. T 7. T 8. T
9. Animals may have instincts for building things, traveling, guarding their place, and living together.
10. Animals may learn by watching others, by trying one way and then another, by doing things over and over, by learning one thing because of another, and by working out problems.

**Unit 3 Heat and Temperature**

1. T 2. F 3. T 4. F 5. T
6. Heat can melt things and make things take up more space. Heat can also boil things.
7. To keep from getting burned; to keep warm when it is cold oustide, or cool when it is hot outside.
8. The sun, rubbing, electricity, and fire.
9. It's important in finding out just how hot or cold something is (temperature).

**Unit 4 Sounds Around You**

1. higher 2. lower 3. lower 4. higher
5. They may differ in how high or low or how loud or soft they are. They are all caused by something vibrating.
6. Hearing with both ears helps me hear more clearly and helps me tell where sounds are coming from.
7. Guitar: plucking strings; Drum: hitting the drumhead; Horn: tightening the lips and blowing into it.

**Unit 5 Water in Your Environment**

1. unsafe 2. a need 3. uses 4. oceans
5. sale 6. d 7. e 8. c 9. a 10. b
11. c (Reasons will vary.)

**Unit 6 Location, Motion, and Force**

1. a 2. b 3. curved, straight
4. near; far 5. tracks
6. They might help me find my way or they might help me find something I am looking for. They might also help me describe the location of something to someone else.
7. When I ride my bike, I am moving in reference to the ground but not in reference to my bike.

## Teacher's Notes

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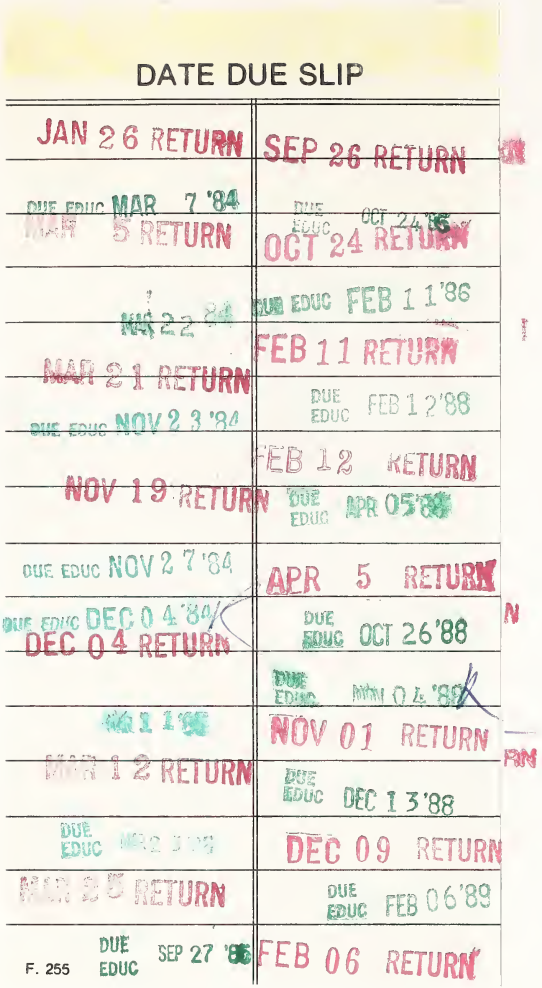
DATE DUE SLIP
JAN 26 RETURN
DUE EDUC MAR 7 '84
MAR 5 RETURN
MAR 22 '84
MAR 21 RETURN
DUE EDUC NOV 23 '84
NOV 19 RETURN
DUE EDUC NOV 27 '84
DUE EDUC DEC 04 '84
DEC 04 RETURN
MAR 12 RETURN
DUE EDUC
MAR 25 RETURN
F. 255 DUE EDUC SEP 27 '86
SEP 26 RETURN
DUE EDUC OCT 24 '86
OCT 24 RETURN
DUE EDUC FEB 11 '86
FEB 11 RETURN
DUE EDUC FEB 12 '88
FEB 12 RETURN
DUE EDUC APR 05 '88
APR 5 RETURN
DUE EDUC OCT 26 '88
DUE EDUC NOV 04 '88
NOV 01 RETURN
DUE EDUC DEC 13 '88
DEC 09 RETURN
DUE EDUC FEB 06 '89
FEB 06 RETURN

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